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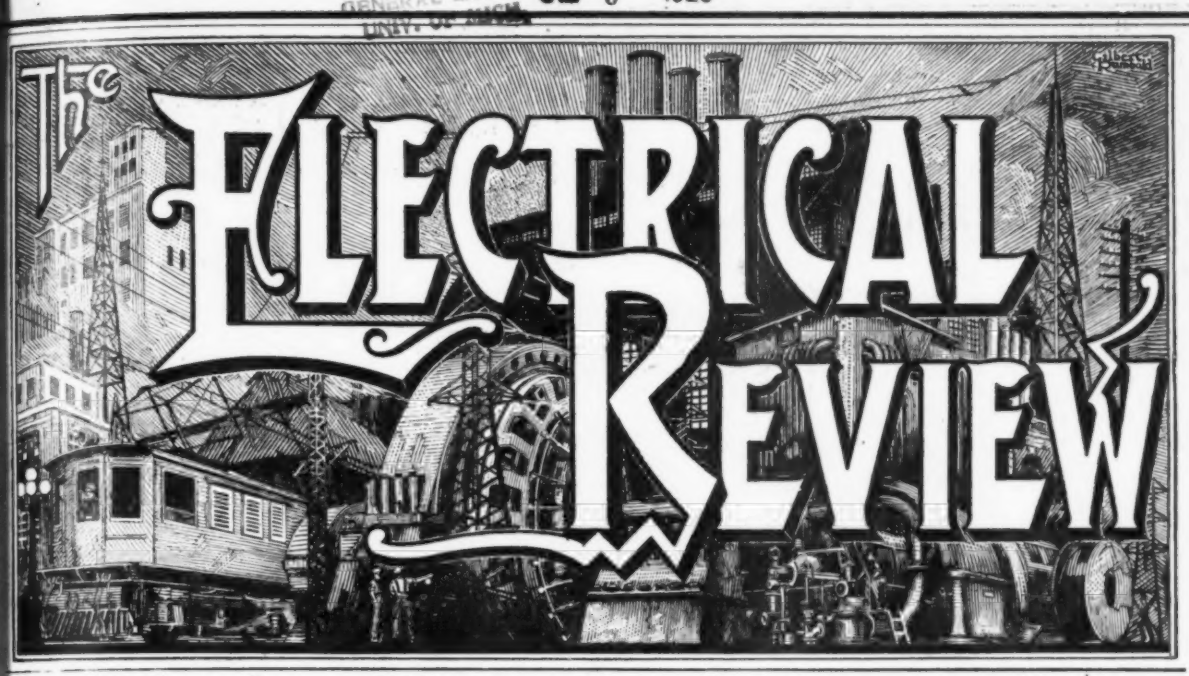

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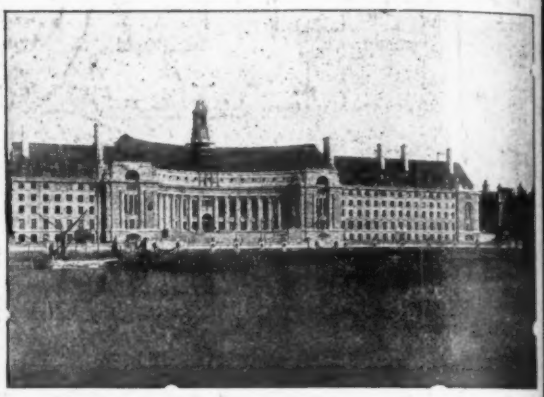

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THE
ELECTRICAL REVIEW.

VOL. XCIII. AUGUST 24, 1923. No. 2,387.

ELECTRICAL REVIEW.

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TRADE WITH RUSSIA.

As has been pointed out on previous occasions, the possibilities for the transaction of trade with Russia in the indefinite future are enormous, and those who are the best prepared and equipped for the arrival of this stage will undoubtedly reap the fruits of their labours. Private commercial missions from different countries, including the United States, France, and Germany, have already paid visits to Russia to investigate the conditions and prospects in so far as it is possible to do so during a short stay in that country, and a similar mission from England is now reported to be about to proceed to Russia.

Mr. J. Ellis Barker, who discusses the possibilities of the Russian market in a recent issue of *Imperial Commerce*, shows how the Germans have dominated Russia since the time of Peter the Great, the Russians having procured from Germany their generals and scientists, their foremen and skilled workmen, merchants and doctors, professors and teachers, and their methods and ideals. As the old middle class has disappeared, he says that the Russians are now far more dependent upon foreign merchants, engineers, managers and foremen than they were in the past.

The needs of Russia, in the opinion of Mr. Barker, can be satisfied by Germany, which has a large surplus of trained experts, and "hundreds of thousands" of suitable Germans know Russia, have travelled or resided in the country, know how to manage the people and understand the language. On the other hand, America, Great Britain, France, and Belgium have no such surplus, and even if they had, he states that they would not know the Russian language. He believes that the vast quantities of iron and steel, rails, machinery, tools, &c., which are required in Russia will be partly supplied by America because that country specialises in the production of masses of goods, and by Germany which follows a similar policy. But England, specialising in highly finished articles in relatively small quantities, cannot supply the bulk of the goods which Russia needs. If England wishes to do business in Russia, Mr. Barker states that she must either train tens of thousands of young men or she must do her business through Germans, who know both the country and the language.

It naturally remains for the future to determine whether the bulk of the requirements of Russia will be met, as Mr. Barker says, by America and Germany. Certainly the latter country possesses great advantages in the directions indicated, together with the benefits of propinquity and the distribution system for goods organised by German companies and German colonist associations in Russia. Moreover, the German manufacturing establishments have to a large extent been reconstructed and re-equipped in the past few years so as to be able to offer strenuous competition with other countries as soon as conditions become favourable for this purpose. But it must be remembered that the time has not yet come for the actual transaction of business with Russia on a large scale, and before that period does arrive it should be possible for England to intensify her efforts with the object of securing a large share of the trade.

What is the position at the present time? Russian imports have hitherto been paid for in gold or by way of bartering, as no country is willing to grant credit to a nation which has repudiated its former debts and might again refuse to pay for deliveries at the present or in the future. Under existing conditions, no

security exists for life or property, and such security can only be recovered through the conclusion of binding treaties of commerce which would give mutual guarantees in these respects to the subjects of the contracting countries. Even in the case of the so-called concessions the same uncertainty prevails, as there is nothing to prevent undertakings which have once been nationalised from being again nationalised after having been handed over in the form of concessions; and of the many concessions which, according to the Soviet newspapers, have been granted to foreign firms, we believe there is not a single one which is being actually worked at the present time.

Under the circumstances and unless the unexpected takes place, it looks as if many years will elapse before any considerable amount of import trade will take place in Russia, particularly owing to the lack of funds with which to pay for purchases from abroad, except by bartering on a small scale; while at the same time the internal conditions of the country are not such as would warrant the assumption that the exports will become of much importance within a measurable period. The only means of setting Russia on her feet again lies in the raising of foreign loans for this purpose, but we repeat that until adequate security is given with regard to past liabilities and for possible new obligations, there seems to be no prospect of the economic regeneration of Russia. Any development in this direction will probably occupy many years, and there should therefore be ample time for British firms to make their preparations for participating in the import trade of Russia, provided that further delay in the matter is avoided. As is well known, the Germans have been making, and are continuing to make, extensive arrangements for the cultivation of trade with Russia, and British firms should not lag behind in this respect.

The Prevention of Corruption.

We have received from the Bribery and Secret Commissions Prevention League a pamphlet entitled "The Case Against the Fiat." It constitutes a powerful plea against the necessity of obtaining the fiat of the Attorney-General before taking proceedings under the Prevention of Corruption Act.

The Society objects to the fiat on the grounds of delay, expense, and occasional injustice, as it lays upon the Attorney-General the duty of deciding upon evidence which is usually anything but complete. It is pointed out that the fiat is not necessary with regard to prosecutions for most other offences; and therefore in this Act the fiat is a special obstacle interposed in the path of justice. The pamphlet quotes many distinguished authorities in support of its views, and gives the history of the Bill introduced and successfully blocked in 1912 for abolishing the fiat under the Act.

Since then the League has not been able to obtain progress for the Bill. It appears that up to 1923 the organisation had applied for the fiat in thirty-five cases, and been refused it in eleven. The average time taken for decisions worked out at about forty-seven days; and, after sixteen years' experience, the League is more strongly opposed to the fiat than ever. Under the Act a total of three hundred and eighty convictions have been secured by various parties, or an average of about twenty-four cases a year. We imagine that this is a very small proportion of the actual transactions in which corruption plays a part; but it justifies the claim that the Act is not a dead letter, in spite of the necessity for the fiat.

While we would not oppose any measure calculated to make the Act more effective, we are still of the same opinion as formerly that its great defect, and the one which chiefly defeats its object, is that it does not discriminate between the briber and the bribed. In business matters it is safe to assume that no one would go round distributing money as bribes if he could obtain his orders without doing so; and it is the person in a fiduciary position who takes the bribe, and thus betrays his trust, who should be punished first and hardest. The man who gives the bribe is frequently an agent or commercial traveller whose principal would disclaim all responsibility; but the latter really finds the money in one form or another. The traveller is only doing what he conceives to be his duty to his employer in attempting to obtain orders by any means. The worst offender is the man seated comfortably in the buyer's chair, who says, in effect: "If it is worth my while, I will give you the order." He betrays his trust by permitting himself to be corruptly influenced; and as long as the law refuses to recognise the difference, and punishes the giver and the taker with equal severity, neither of them will ever tell, even though they may eventually quarrel.

It seems to us that, as long as things remain as they are, the League should not confine itself to taking action in clear and important cases (not such matters as small tips to employés for small services), but should devote itself more and more to education. It should press for a model question to be put in all public and private examinations, bringing out the true nature of corruption. It should endeavour to influence the Press to educate the public. It should use all its influence with employers to pay their buyers properly, so as to reduce the temptation.

As recently as the 19th inst., *The Times* Parliamentary Report gave a declaration from a Member that he had secured his goods from the Ruhr by sending from this country a youth who "by bribery and corruption—ten shillings here and ten shillings there"—got his goods across the frontier. This naive confession was received in the House with "laughter." Will the honourable member be able to convince the youth that what was right in the Ruhr would be wrong over here? He might say that he was only bribing to obtain his rights! The chief blame clearly rests upon the corrupt officials who would not pass the goods until they were bribed. Nevertheless, if the bribe had been given over here, both youth and honourable member would have been amenable to the law.

It would, in our opinion, be impossible to lay too much stress on the cultivation of sound public opinion on this vital matter.

Municipal Tramways.

In his presidential address to the Municipal Tramways Association, whose conference at Portsmouth concludes to-day, Ald. Sir John Timpson admirably summarises the duties of a municipal tramway department, but points out that owing to the conditions obtaining since the great war, some authorities have not been able to discharge them rigorously. Whereas in 1913-14 tramway undertakings contributed well over half a million sterling to the rates, in 1921-22 they could spare less than one-third as much for that purpose; and whilst before the war they drew upon the rates to the extent of only £62,600, in 1921-22 they received from that source a subsidy of no less than £371,303. Consequently instead of aiding the rates with over half a million net, they cost the ratepayers nearly £200,000, a total change of £700,000 in round figures, which is due to the heavy increase in working costs. Sir John rightly holds that the user of the tramway service should pay for the convenience, and that the service should be self-supporting. He sees no hope, however, of the removal of the unjust financial burdens under which tramway undertakings labour.

We are glad to see that he gives due credit to the National Industrial Council for the maintenance of harmonious relations between employers and employed;

only by close co-operation between all parties can we hope to avoid disastrous conflicts which usually result in loss and injury not only to those engaged in the industry but also to the general public.

Electricity Supply in Norway.

A survey of the general situation of electricity supply works in Norway has been published by M. Norberg Schulz, manager of the Trondhjem electricity works, on the basis of information collected during the past winter regarding the position on June 30th, 1921. On that date, it is stated, the country was equipped with 293 generating and distributing stations, which had involved an expenditure of 510,000,000 kronen. The amount written off was 60,000,000 kr., or 11.8 per cent., and these appropriations applied substantially to the stations situated in the towns, whereas comparatively little had been written off the works in the country districts. Most of the town stations were profitable undertakings, but the country stations which were constructed in recent years scarcely had any sums available for depreciation. It is calculated that the capacity of the works in June, 1921, was approximately 300,000 kW, and the capital invested in the supply works and their subsequent extensions amounted to 1,000,000,000 kr. at the beginning of 1923.

Apart from the above survey, it is known that some of the existing works were built and equipped when the costs of construction and of plant were very high, and these undertakings have been unable to redeem or pay interest on the loans. On this question it is now reported that the State Waterfalls Administration of Norway has forwarded to the Department of Industry a proposal recommending the grant of financial assistance to a number of communes which have established hydro-electric works. It is stated that about 40 works which are unable to pay interest on the invested capital have made application for such aid, the total capital concerned being 200,000,000 kronen. The question has been referred to the Department of Finance, which will inquire as to which of the communes are the most unfavourably situated, as it will be impossible to afford State financial support to all.

A Register of Electricians.

We learn from Mr. W. J. Webb (London District Secretary of the Electrical Trades Union) that his Committee has instituted a bureau at the London offices, 14, Baldwin's Gardens, Gray's Inn Road, E.C.1, for the supplying of electricians and electricians' assistants to employers requiring this class of labour. The object of the scheme is to supply the "right man for the right job." In future, we are assured, when an employer requires a reliable and efficient workman for a particular type of job, all he need do is to ring Holborn 4745, state his precise requirements, and be sure of having sent him, without delay, a really competent workman used to the special type of work specified. Mr. Webb informs us that since the inauguration of this special scheme some five weeks ago, over seventy men have been placed in response to inquiries from various employers, with complete satisfaction to both parties.

We cordially welcome the introduction of this system as an important step in the right direction. Just as membership of an engineering institution should be a guarantee of professional competence, so, in our opinion, should membership of a "craft" trade union constitute a certificate of expert craftsmanship, and we congratulate the Electrical Trades Union on its recognition of the need for really skilled workmen, together with the steps it has taken to meet the demand. Employers may be counted upon to support the scheme, which affords evidence of a desire on the part of the union to co-operate with them for the benefit of the electrical industry.

The Swiss Electrical Industry.

Some information concerning the situation of Swiss industry is contained in the annual report of Brown, Boveri and Co., of Baden. After referring to the increased cost of living due to the situation of the market and partly also to internal conditions in Switzerland, the report states that the high wages and the shortening of the working day render the company unable to maintain competition with other countries, and the industrial crisis in Switzerland prevents the electrical industry from getting the work of which it stands in need. Thus the demand for electrical energy has slackened; there is also an excess of production which vainly seeks a useful outlet. As a consequence, new central stations and their associated installations are not being undertaken. On the other hand, the deliveries to the Federal railways form partial compensation for this state of affairs, and it is satisfactory that the railway authorities, encouraged by the results of electric traction, have been induced to accelerate the electrification of the lines.

Besides the too-high cost of production, the report states that the capability of exporting electrical manufactures is seriously embarrassed also by high duties in some countries which really represent vetoes on imports. But Switzerland does not possess sufficiently strong political and economic factors to react, and is therefore absolutely powerless in the matter. Notwithstanding that the company's extensive sales organisation has been developed in a certain number of transmarine countries in order to ensure new markets, it has been impossible to obtain sufficient orders to occupy the normal number of workmen at the Swiss works; the number employed at Baden and at Munchenstein has decreased by 1,200 as compared with a normal year. As a consequence, the output capacity has diminished by 25 per cent., which figure is increased to 40 per cent. owing to the shorter working day and the fewer orders; whereas the general expenses have remained almost without change. Under these circumstances, it would be necessary for orders to be increased by two-thirds in quantity to reach full production and re-establish a normal proportion between output and expenses. The impression prevails that the present situation, as in the case of England, only represents a transitory wave, perhaps caused by the occupation of the Ruhr. Further, the prices obtained during the past few months have been quite inadequate.

Some further information on the question is contained in the monthly bulletin of the Swiss Bank Gesellschaft, which states that the country is faced with a period of stagnation in the construction of power stations. The greatest hindrances are occasioned by the increased costs of construction, mainly on account of too high wages and too short a working shift. Unlike the works which were built at less cost before the war and which have been largely written down, the power stations which have since been constructed under such expensive labour conditions find it much more difficult to provide an acceptable yield on the capital outlay. As a consequence, and until further notice, only such water powers will be able to be utilised as, owing to their natural advantages and convenient positions, promise to be highly efficient, and only then when the sale of the energy is assured. But as hitherto, it is true that the possession of electric power represents a potent factor in the hands of the owner and permits him to carry out undertakings which are denied to others, and in close connection with this is the fact that many of the largest works have been established by public authorities or otherwise supported by them. This explains the efforts both of the Federal Railways and the large private undertakings in electro-chemistry and metallurgy in the direction of the establishment of their own power stations, for the sake of independence and freedom of action. Despite the great importance of these works, it is concluded that there will still be room for the development of private undertakings when the present crisis has been overcome.

ELECTRICITY SUPPLY PRICES AND PROFITS.

By Hy. M. SAYERS.

The summaries of the accounts of electricity supply undertakings which the Electrical Review has published during the last few months, have consistently shown increased sales and improved financial results for last year. This cheerful feature has characterised the accounts of both municipal and company undertakings. Accounts which terminate with a loss are conspicuous by their absence, and in those cases where deficits have occurred in recent years, last year has made good wholly or in great part for the foregoing lean years.

This is a cheerful and heartening fact, but it seems timely to look at some of the figures, remembering that the prices charged for supply have been relatively high, that considerable additions to pre-war tariff prices have been and are still current, and that a number of undertakings have been granted and have exercised powers to increase their maximum prices.

To get a general view of the situation, it has seemed desirable to put together returns from a number of undertakings of diversified size, locality, and general conditions, so that the figures may be considered as fairly representative of the whole supply industry. To that end there has been no selection of undertakings, the accounts have been taken as they are available. It is to be regretted that the accounts of many of the municipal undertakings are not yet obtainable, owing to their accounting period terminating generally on March 31st, and the Scottish municipal undertakings, with their year ending in May or June, are for that reason entirely unrepresented in the group considered. It is particularly regretted that hardly any of the London borough accounts have been available.

It is a continual nuisance to anyone who wishes to compare electric supply statistics that there is not a uniform accounting period for all undertakings, but perhaps the convenience of such persons is hardly worth the trouble of disturbing existing arrangements.

The undertakings to which the following figures relate are 23 municipal and 36 companies; they are located all over the country—though there are no Scottish municipalities included for the reason exposed—they include some of the largest and some of the smallest undertakings in both classes, and are quite fairly representative in other respects. No power companies are included. It is not the writer's purpose to deal with or compare individual undertakings, but to take a broad survey of the facts shown by the figures in the lump. The complete analysis of electricity supply accounts, and especially comparative analysis of those of different undertakings, is an intricate business. One generally needs a good deal of inside information in addition to the published accounts, because, despite the statutory standardisation in form of these accounts, there is plenty of scope for individualism and ingenuity, and a wide variation in the treatment of many items, as well as in the care exercised in detailed allocation. Hence, for the present purpose, the figures utilised are those which are broadly comparable, and it may be reasonably assumed that differences in accounting methods cancel out sufficiently closely.

These broad figures of the 59 undertakings mentioned are shown in the following tables:—

TABLE A.

Lumped figures of 59 supply undertakings for the year ended December 31st, 1922, or March 31st, 1923, to nearest £1,000.

Gross receipts.	Working expenses.	Net receipts.	Capital charges.	Net profit or surplus.
£9,027,000	£4,480,000	£4,547,000.	£3,023,000.	£1,524,000

Total units sold, 787.232 millions.

The first three columns are not open to much discussion; there can hardly be any question about gross receipts, working expenses, and the difference of these two sums. The following amounts, "Capital charges" and "Net profit" or "Surplus" may raise some questions. Obviously, local authorities and companies are under somewhat diverse obligations in respect of the disposal of their net revenue. In making up these figures from the accounts, no regard has been paid to amounts brought in from previous years, and, as far as the information permits, the surplus of net profit includes amounts put to reserve beyond obligatory provisions. But it is more than probable that some of the items which for lack of detailed information have to be put into the "Capital charges" amount would prove, on examination, to be in the nature of profits. This is particularly the case with companies, but also obtains in some of the municipal undertakings. Hence, it must be understood that the division between "Capital charges" and "Net profits" is unavoidably a somewhat rough one. In all probability the capital charges figure is higher and the profits figure lower than a strict analysis of every case would reveal.

The figures, as given, show at once that the working expenses are very closely 50 per cent. of the gross receipts, and it is a striking fact that this proportion is closely approached by nearly every individual set of accounts. It cannot be supposed that the managements of electricity supply undertakings generally adjust their tariffs to produce twice their working expenses, but such is the general effect, and it can be said that, in general, last year the working expenses of typical supply undertakings absorbed half the gross revenues. Of the other half, about two-thirds went to satisfy capital charges. This is an elastic expression. In the case of municipal undertakings it includes interest on loans and instalment of loan repayment. It frequently covers other items classed as depreciation, reserves for various purposes, and so forth, some of which are in the nature of profit. In the case of companies, the items under this heading are much more varied. They include interest on debentures and loans, payments to sinking funds for the discharge of such obligations, to depreciation funds, and to reserve funds of various kinds. The limited tenure of the companies generally, and the near approach of the dates at which compulsory purchase powers may be exercised in particular cases, naturally dispose companies to make provisions of this kind in excess of what would be considered necessary if they had a perpetual or very prolonged tenure. The remaining third of the surplus of receipts over expenses, designated net profits or surplus, is, at any rate, a clear profit. It is of little importance for the present purpose to follow the distribution of this surplus. It may be remembered, however, that municipal undertakings are under statutory obligation to devote some of it to reduction of prices—after their reserve funds reach a certain proportion of the capital of the undertaking.

It may be convenient to tabulate the figures given above in percentages of the total receipts.

TABLE B.

Percentage distribution of income of 59 supply undertakings for the year ended December 31st, 1922, or March 31st, 1923:—

		Per cent.
Gross receipts	£9,027,000	100
Working expenses	4,480,000	49.6
Capital charges	3,023,000	33.5
Net profit or surplus	1,524,000	16.9

and also to put the figures against the "Units sold."

TABLE C.

Units sold—	787,232 millions.	Per unit.
Gross receipts	£9,027,000	2.752d.
Working expenses ...	4,480,000	1.366d.
Capital charges ...	3,023,000	0.922d.
Net surplus	1,524,000	0.465d.

In considering the relationships between profits, prices, and costs, one is bound to look at the capital expenditure on which a return has to be earned, and also to look at the relations between the actual utilisation of the capital employed, or rather of the plant employed, and the possible attainable utilisation. The following figures provide some of the data for this consideration.

TABLE D.

Capital expended, plant capacity, and maximum loads of 59 supply undertakings for the year ended December 31st, 1922, or March 31st, 1923.

Capital expended.	Maximum load.	Plant capacity.
£37,414,000	436,000 kW	626,000 kW.

Note.—Figures taken to nearest £1,000 and nearest 1,000 kW.

Now, these figures are the face figures shown in the various accounts. As regards the capital, it is certain that the sum set out is in considerable excess of the "live" capital employed. Many municipalities and companies do not write off from their capital account the amounts paid off loans and those credited to depreciation funds. In some individual cases which the writer has had occasion to examine, it has appeared that the original value of plant scrapped and sold, with all loans paid off, still remains in the capital account as capital expended, and he has not found it easy to agree with the accountants of the undertakings on the question of the true amount of capital employed in the undertaking. No doubt the accountants have a case for the manner in which they frame their accounts, but the effect is to exaggerate in some considerable measure the amount of capital value in beneficial use. It is perhaps, on the whole, more difficult to get at this amount from the accounts of companies than those of municipalities. This is not a criticism of the accounting methods employed, which, no doubt, have their justifications. It is perhaps only a statement of an inevitable difference of viewpoint, and these remarks are made to show that, taking the face figures gives a very full value to the return on capital required.

With respect to the plant capacity, there is reason to think that the figures are somewhat in excess of effective plant capacity. There are cases where the relation between maximum load and plant capacity is such as to suggest that there is a good deal of plant in the stations which is effectively obsolete and is not actually used. It will be seen that for aggregate maximum loads of 436,000 kW, there is an aggregate plant capacity of 626,000 kW, which shows aggregate "spare plant" of 43 per cent. over the maximum load. Clearly this is not a fair representation of the real condition, and it is noticeable that the preponderance is mainly due to a comparatively few undertakings, some of which have a plant capacity of from twice to thrice their maximum load. A very few return a larger maximum load than plant capacity, which in some cases is explained by the receipt of bulk supplies. As it is quite impracticable to adjust capital account to correspond to what may be called actuality, one is obliged to use figures which are certainly in excess.

With these notes and cautions the various figures can be discussed. Taking first the return on capital, it will be seen that £37,414,000 earned a gross turnover of £9,027,000, or 24.1 per cent., and a net return, after deducting working expenses, of £4,547,000, or 12.15 per cent. The latter figure is the sum of "Capital charges" and "Net surplus." There is no question that "Capital charges" includes a proportion of what would be correctly considered as profits in a private business. Notably, it includes all the interest payments on municipal loans, and on the debentures of companies, payments which are income to the holders of those securities, and are true profits *quâ* those investors. There are other items in this capital charges sum which are in the same category. It is quite a difficult matter to separate these out when one has full details of the accounts and access to the books; also there are differences of opinion as to what constitute "profit," and it seems best, therefore, to treat the surplus of gross receipts over working expenses as a single item. An important part of it represents depreciation. The loan repayments of the municipal undertakings must be taken as the equivalent of depreciation. If they redeem the original value of the plant by the end of its economic life, they are the correct equivalent; if they redeem it before that life ends they are in excess, and the balance is, in fact, a profit; if they fail to redeem the whole value in that time, then sound finance would say that some further provision must be made for depreciation. As a general rule, the regulations for the repayment of loans by the municipalities are well on the safe side, and in most cases the municipality acquires a considerable amount of debt-free assets of value, capital, in effect, provided by the consumers.

It is quite clear that the true depreciation of the assets of an undertaking must be provided out of the gross receipts, and that such depreciation is a true part of the cost of the service rendered.

It is also true that capital cannot be obtained for any undertaking unless there is a prospect that the return made to the investors will be at some rate which attracts them.

Taking the face value above set out, what can be said to be the proper amount of these two items—depreciation and return on capital?

The answers to these questions are not very easy to give, certainly not so easy as they were up to the year 1914, and although prices and values seem to be approaching stability, there is yet a feeling of uncertainty about future conditions which leads to considerable differences of opinion.

The main points of uncertainty affecting depreciation charges are the cost of replacement of plant as it becomes unserviceable and the return which can be obtained on investments for sinking fund and depreciation. The present position and immediate prospects in respect of the cost of replacing plant are very much easier than they were between 1919 and 1921, when prices ruled up to three times pre-war rates. At the same time, the interest rates obtainable on safe investments have diminished, but not in anything like the same proportion.

It must be recognised that not all the subjects included in the capital expended are subject to depreciation. Lands, for example, are of permanent value, though municipal authorities, having borrowed money to acquire them, have to provide annual instalments for repayment until that is completed. And there is certainly a considerable deduction to be made in respect of the capital expended by both municipalities and companies, for plant scrapped and replaced out of revenue, directly or by the operation of depreciation and reserve funds.

Taking all these considerations into account, it seems to be a reasonable guess that the amount of 37½ million pounds, as above set out, covers no more than 30 million pounds for which replacement has to be provided.

Assuming an "equated period" of 20 years for this sum, and using the 4 per cent. tables, the annual percentage for amortisation is 3.36 per cent. Call it 4 per cent. as a round figure, with a margin of safety. Then the annual requirement, 4 per cent. on 30 million pounds, is £1,200,000. The return on capital or the interest required by investors is more debateable. Local authorities can now raise money at about 5 per cent. Two or three years ago they had to pay 6 or 6½ per cent., and naturally raised as little as they could on those terms. But before 1914, 3 to 3½ per cent. was quite a usual figure, and a fairly considerable part of the electricity supply capital, represented by unpaid

balances on loans, was raised under those conditions. It was usual then to reckon that from 6 to 6½ per cent. covered both interest and repayments on municipal borrowings. Some cases examined by the writer since the war showed that even with considerable expenditure during the war and post-war periods the aggregate rate was about 7 per cent. on the "live" capital. At this date a quite outside figure to cover interest and repayments is 7½ per cent., and it is falling. This amounts to £2,250,000 on the £30,000,000 taken as live capital, and appears to be the minimum sufficient surplus, contrasting with the amount of £4,547,000 actually obtained.

(To be concluded.)

PATENTS.

(Communicated.)

The correspondence on my article, on "The Nation and Inventors," which appeared on June 22nd, is gratifying and interesting, particularly the remarks by Mr. Robertson, who has undertaken the duties of *Advocatus Diaboli*. His useful comments enable me to put forward points which need examination.

First, as to the flimsy pretexts which the law makes use of for quashing patents for useful inventions. We will take the two great lamp patent cases, which are recent, and which were fought out to the bitter end by people who had unlimited money. If ever there were two inventions which were real inventions, worked out by the sweat of brow and brain, and which were useful to humanity, the inventions of drawn tungsten wire for electric lamps, and of the gasfilled lamp, were such. One need not labour the point: they were wanted, they were produced by enormous skill, labour, and expense, and they met a long-felt want. But in the Law Courts the patent for the drawn-wire lamp was quashed, while the gasfilled lamp patent was declared invalid by the first two Courts, and was not upheld until it got to the House of Lords. Had the owners of the latter patent not had unlimited resources, they must have lost the day, and the fruit of their superb work would have been stolen from them. With reasonably straightforward and honest laws, the judges would have found no difficulty in coming to a quick decision in favour of the patentees in both of these cases, and probably the actions would never have been fought. Let us not close our eyes to the facts. Cases like these paralyse invention and deprive the nation of ideas which it sadly needs. If we could get behind the scenes, we should find that quite a number of inventions, of great public utility, have been abandoned because of the uncertainty of upholding them in the present state of the law. I know of such cases personally.

Now let us take the attitude of Shylock at the Income-tax Department. An inventor patents an invention, and, say, pays £50 in expenses, which may be verified without a shadow of doubt as being out-of-pocket as costs for protecting his idea. He deducts the money from his income-tax return, but Shylock explains that it is not a revenue expense; royalties are revenue, of course, but expenses are not; but if—*if*, mark you—the inventor gets royalties from his patent he will be at liberty to deduct patent costs from the said royalties.

Obviously, if the patent costs are revenue when royalties come in, they are revenue costs before that event, but Shylock replies that he will not allow it. Not only so, but if the inventor spends, say, £300 on taking out a number of patents, and if he finally gets £300 for one of them, he has made no profit. But, says Shylock, he will be allowed to deduct costs amounting, say, to £50 from the royalties of the one patent for which he has received the £300, and he must pay income tax on the £250 balance. The inventor may point out that he has received no profit at all, but that the whole of the £250 has been paid for taking out patents which have not succeeded, and that, further, he is largely out of pocket for experimental work, for which no claim is allowed, but Shylock shrugs his shoulders, and sees that he gets his pound of flesh. Of course, it is not honest, the most expert casuist could not make it appear so, but it is the income-tax method. If only the Trade Unions would take the matter up and cause the Government to lose a seat over it, the law would be changed *instanter*, but that is not likely. Inventors have no power, and must e'en put up with injustice. The income-tax people don't do that sort of thing to factories, which have sufficient influence to stand up to them, but the outside inventor has neither political power nor friends, and he must just pay up.

I quoted the case of Taylor's Fire Grate. Mr. Robertson says that the grate had been invented by someone else, but Swan, in his book on "Patents," does not record this; he says that the patent was invalidated merely because the grate had been exhibited to the inventor's friends in his private house. The discussion of the whole subject in Chap. I of Swan's book is interesting and instructive, and it is clear that the writer himself is of the opinion that a patent may be upset upon a very trivial technicality.

Now we come to the central point of the argument, namely: Why should inventors get protection under the law? I maintain that they should right away disclaim any rights as inventors—it is a waste of time for a body of men with no political influence to ask justice where it may be maintained that it is to the interest of the mass of voters that they should be ill-treated. The basis of their claim should be that they require the same kind of protection that is given to grouse, wild birds, trout, and turnips. The man who steals turnips is punished—not because turnips have rights, but because it is desirable in the public interest that turnips should not be stolen. So we must get legislators to understand that it is not in the public interest that inventors should be prevented from developing their ideas. Let us get into the minds of our politicians by some means the fact that probably not five out of every hundred patents taken out are worth anything. Why is this?

It is because the very best of our inventive faculty is sterilised. It is an absolute fact that the men who are most capable of inventing, the men who have ideas that the nation needs, men who have all this, but who have not enough money to defend themselves in a hard-fought action, do not bring out their inventions. They bury their ideas. This statement may seem startling, and there is no room to develop it here, but it is a fact.

Mr. Robertson speaks of the need for the protection of the public. My article of June 22nd dealt with this at some length, and recommended a method of compulsory licence which would be fair to all parties. If Mr. Robertson will refer to it, he will get further details.

Having dealt with matters controversial, let me finish on a more solemn note. Day after day in our town I see crowds of workmen standing about idle, and I also see them lining up at the Labour Exchanges for their "doles." Sometimes a man refuses employment, because he says it will interfere with his dole. At the same time I am sending orders for hundreds of pounds' worth of material to America and foreign countries. The goods which I am getting there are not cheap, some of them seem to be exorbitant in price, but when I inquire for home-made stuff I am told that the foreign goods show

some inventive points that the home-made goods lack, and they are preferred. This is happening in the country which produced the great train of inventors, including George and Robert Stephenson, Whitworth, and Parsons! It ought to cause us serious thinking, but does it? We find employers who expect everything to be remedied by low wages, which incidentally mean discontent, inefficiency, and low spending power; trade unionists who believe that twice as many men would be employed if every man did half work, although they themselves always buy the cheapest goods they can get and never pay a penny extra for the home-made article; and newspaper stunters who advocate unlimited beer and betting.

The nation would gain infinitely more than it would lose if it set out to encourage invention to the uttermost, and if it made every inventor feel that, at any rate so far as the law is concerned, the inventor will not lose his reward by the legal quibbles which now are sufficient to upset useful and valuable patents. We need that invention should be common, that every works of any size should have its quota of inventors who draw money for useful work, and, in short, that invention should be in the air. Let us aim at that, and trade will improve, and many of our difficulties will vanish. Let us muddle on in the present stupid way, and we shall have to face troubles which will be not the less painful because deserved.

QUOTATIONS THAT SELL.

By J. O. KNOWLES, B.A.

Considering that the quotation is the only unit in the selling organisation which has an undoubtedly good reception, it is often surprising to see how little the quotation helps to sell the goods, apart from the mere statement of price. The majority of quotations are built up from catalogues, prepared often at great expense as part of an elaborate scheme of publicity, and yet the estimating staff often fail to make their quotations "tell the tale," or help the customer to appreciate the advantages of the particular offer. No salesmen would be content merely to specify in detail the goods he offered; on the other hand, a quotation must be brief. Yet between the personal explanations of the salesman (if he is permitted to make them) and the printed formal specification, there is scope in every quotation for some expression of individuality which positively helps to sell the goods.

In some firms the estimating office, the district representatives, and the publicity staff are either under the same control or so closely in touch as to learn day by day their common lessons in salesmanship, but often much of the estimating work is in the hands of clerks who have never been on the road, and who just grind out quotations accurately but almost mechanically from catalogues, without much appreciation of the art of selling, and without inspiration or guidance in the formulation of a quotation so as to attract and impress the customer. "We are in receipt of your esteemed favour of the 23rd inst., and in reply have pleasure in quoting you for our X29/6———" followed by a succession of technical phrases, which all at the office probably understand more easily than the customer.

Many quotations are an excellent specification for the works departments, familiar with the phrasing and application of each description, but the customer must accept the quotation before the office copy reaches any productive department! Consider, for instance, the mere spacing and lay-out of a typewritten specification—the more involved the quotation the more the scope for neat arrangement of the typing to separate clearly section from section, and to bind together the details of any particular offer into a compact whole, nicely summarised, and closely associated with its particular price. The more confusing the arrangement of a quotation, the less attention it receives from the customer—who is then likely to do nothing more than abstract from it notes of price and so on, and perhaps make these notes upon another quotation, which thereby receives a double share of attention, while all the good points of the first offer are left unregarded.

There cannot be much publicity matter in the average quotation. Most tenders are sent to firms who are old customers, or who have at any rate some knowledge of the manufacturer's stocks. It is not suggested that quotations should be made a medium for advertising matter that is more properly presented in trade journals, in leaflets, in catalogues, and by salesmen. Nevertheless, there is, undoubtedly, scope in every quotation for a phrase or sentence or two which may just turn the scale. Even to those clients who are established customers and who rarely buy or factor other makes, quotations having each a touch of individuality, confidence, persuasiveness, or explanation have a cumulative effect, which maintains the good relations between manufacturer and client.

No one knows more clearly than the head office staff—or, at least, no one ought to know better—the features in each type of product which are in advance of competitors' designs, and yet, even in mentioning these advantages, many, in quoting, assume that the customer has an equal knowledge of the merits of each attractive feature, whereas this is unlikely enough to merit at least one or two words of explanation in each tender, pointing out just why these features are worth accepting. It is easy, for instance, to specify aluminium pans as "cast —not pressed," but the customer may not realise that "thick cast pans distribute the heat up the sides and prevent burning." Of course, a salesman can explain this when he calls, but he may not call for weeks and he may call too late, whereas the quotation, if as good in lay-out and as informative as even a circular letter, is read with care and interest. The more frequently the same firm is quoted, the more brief, of course, must be the publicity matter in the quotation, but there are always one or two reasons which bear repetition.

There must, of course, be a discreet intelligence guiding the use of "publicity phrases" in quotations. The "bald" quotation is safe, and even businesslike, if it is easy to read, to understand and to compare with others. The writer does not believe in lowering the dignity of the house by the use of "snappy" phrases which, till we know better, we shall continue to call "American," and if any departure is to be made at all from the formal specification, let it be done by example and precept from one who can preserve throughout a sense of proportion, both in his own work and that of others, while the new idea is being worked into the routine.

While there is much in the idea of using the quotation to sell the goods, that can only be detailed for a particular class of product, the following suggestions may provoke a certain critical attitude leading to individual thought and decisions.

"We are in receipt of your esteemed favour"—it is easy to criticise the opening sentence, but the writer is conservative enough to appreciate and encourage the use of an initial stock-phrase. It steadies and concentrates the attention of the composer of the letter—like the nervous speaker's "er——er——," and the average Englishman will regard more favourably a quotation beginning "We thank you for your inquiry of the 23rd

inst." than to a letter beginning, say, "Uneeda biscuit"!

A quotation may be quite clear in detail, but confusing in its general arrangement. Before a quotation of any length is accepted, its contents have to be learnt rather than read, and a good lay-out is far easier to remember than one carelessly composed. Some men, in quoting, are too obviously content if they include every item, extra, specification, and price, and in dictating they do not attempt to visualise the quotation as it will appear when typed. Headings are usually given for each separate section, but the insetting is not always consistent or well arranged. The reader, never having seen the quotation before, and not familiar with its contents, needs greater assistance to give him the same grasp of its matter. Insetting with several margins is useful, if the various margins are used consistently, and with a little training, typists can give their quotations a perfection of arrangement which is in itself of selling value.

Where a piece of apparatus is composed of several units, it is better to specify the units in a list, each unit on a separate line, even if there are only three or four. When each unit is sufficiently complex to have a specification of its own, the insetting needs to be well arranged to separate the different specifications, and yet bind the parts together into a whole that is easily related to the lump sum price. Long, technical specifications are out of place in the quotation. They waste the typist's time, and secure no more attention from the customer (who does not often learn very much from them), and an attached specification is more useful to the customer in checking the gear offered, because still more complete details of construction and design can be given without obtruding them where they are not needed. A short specification, emphasising the main and "selling" points of the gear, with a reference to the detailed specification, serves all purposes.

Where alternatives are offered, the essential differences need emphasising, expressly by specification and implicitly by suitable lay-out. For some customers, who can be assumed to have little technical knowledge of the difference in value offered, the main advantages of the more expensive type can be explained briefly, and yet this is seldom done, the too usual procedure being to offer alternatives with a specification of each, but without any useful recommendation. Of course, discretion must be exercised. It is not always possible to give a recommendation at all, from ignorance of the conditions, but a well placed and brief reason for the inclusion of some additional feature may influence the sale and educate the customer—unless he gains the impression that the most expensive type is always recommended, whatever the conditions.

Extras are often a cause of confusion. An inquiry may not be very full or very clear; the manufacturer may think it advisable to suggest certain additions, but these are often typed as afterthoughts in a manner most confusing. In comparing quotations, these extras have to be watched, and used in comparisons, but they are often most difficult to find when wanted, and their lay-out lacks uniformity.

It is a small matter, but prices are often neither directly underneath each other nor closely related to the titular description of each extra. It is often easy to see "Price £ s. d.," but not so easy to see to what this particular price refers, without reading again a portion of the quotation, and this causes an irritating loss of time.

A quotation must be formal, but it should, nevertheless, reflect the reputation of the manufacturer for good manufacturing and business methods. The personal note must be restrained because the quotation is probably being sent to a person quite unknown to the sender, but with a little care and attention to such details as are mentioned above, and a greater appreciation of the customer's point of view, a firm may easily obtain a good reputation for its quotations, and give them a distinct selling value. Good paper, good headings, and expensive folders have their place and worth, but the quotation itself has to sell the goods.

THE MUNICIPAL TRAMWAYS ASSOCIATION (INC.).—I.

ANNUAL CONFERENCE.

On Tuesday evening last, the annual conference of the Municipal Tramways Association was opened at Portsmouth with an informal reception in the Mayor's banqueting room at the Town Hall, held by the President, Ald. Sir John Timpson, K.B.E., O.R.S., K.S.T., chairman of the Portsmouth Corporation Tramways Committee, and Lady Timpson.

A civic reception was given to the Association on the following morning by the Mayor of Portsmouth, Ald. F. G. Foster, J.P., in the lecture hall of the Municipal College, after which the President delivered his address, of which an abstract follows. Mr. A. Baker, general manager of the Birmingham City Tramways, then read a paper on "Birmingham's Experiment with Trolley Omnibuses." A full account of the system referred to was given in the Electrical Review of February 9th, 1923; in the paper Mr. Baker explained the reasons which led the Corporation to substitute the railless trolley omnibus for the tramcar on a worn-out tramway track, which carried only light traffic. The new system, he said, immediately became popular; the trolley 'bus gave the passengers a most comfortable ride, with an entire absence of the jerks to which change-speed gears always give rise, and were practically noiseless. The increase in traffic had been maintained, and the revenue also improved. As the result of four months' working, the author stated that in Birmingham the operating costs of the trolley omnibus were 12.648d. per car-mile, comparing with 14.824d. for tramcars and 15.407d. for motor-omnibuses. He concluded that each system had its own sphere of usefulness, but for dealing with a large volume of traffic the tramcar still held the field. In the discussion which followed, the speakers favoured the consideration of all types of transport vehicles, but strongly demurred to any suggestion that tramways should be scrapped. The question of road maintenance was raised, some speakers holding that if trolley 'buses were charged for this, like tramways, they would show no saving.

In the afternoon of Wednesday the discussion on Mr. Baker's paper was resumed and concluded, after which Ald. H. Clark, of Rochdale Corporation Tramways Committee, read a paper on "Tramways as a Municipal Asset." The paper, which is abstracted on another page, was followed by a discussion.

In the evening the members of the Association were to dine, at the invitation of the Mayor, at the Town Hall.

The programme for Thursday comprised a paper by Mr. R. Stuart Pilcher, general manager of the Edinburgh City Tramways, on "The Economy of New Car Equipment," and the annual general meeting of the Association. A garden party was to be given by Mr. and Mrs. John Rowland after the meeting was over,

and in the evening the annual dinner of the Association was to be held in the large hall of the Town Hall.

For to-day an excursion has been arranged, in the shape of a cruise round the Isle of Wight, for which purpose the Southern Railway has placed a vessel at the disposal of the Association.

Presidential Address.

By Alderman Sir John Timpson, K.B.E., Chairman, Portsmouth Corporation Tramways Committee.—(*Abstract.*)

If you ask me: What is the duty of the individual members of this Association? I should answer shortly:—(1) To carry the largest possible number of passengers at the lowest possible cost, (2) to provide a constant and efficient service for road passengers in their respective communities, (3) to maintain the rolling stock and equipment in a state of efficiency, (4) to discharge the loan obligations within the effective life of the assets, (5) to apportion the total cost of doing so as evenly as possible over that period, with a fractional loading for contingencies—subject always to reasonable and relatively fair conditions of service and rates of wages for those employed. In addition we have to protect the public from a wasteful, erratic, and unnecessary competition.

We have been experiencing and are yet in the midst of greatly disturbed national conditions, and in some instances some of the obligations named above have been passed on from year to year, but speaking generally, most authorities have been at grips with arrears of various kinds, and have made up much lee-way.

In commercial enterprise, the golden rule is:—"Let each year bear its own burdens." It is not always possible to achieve that ideal, but every public representative should discourage as far as possible any other course. In these unstable days there is a tendency sometimes to sail too near the wind, especially in the face of sporadic clamour for reduced fares, and there is a growing danger of falling back upon the rates to help passenger transport undertakings, which from their very nature—available as they are for ratepayers and non-ratepayers alike—should be self-sustained. It is a service differentiated from gas, electricity and water by the fact that it is not laid on to any premises, and is available for anybody. The user should, therefore, pay for the use.

In the last report of the Ministry of Transport upon tramways, attention is called to the fact that in 1921-22 tramway undertakings were subsidised by rates to the extent of £371,303, while in 1913-14 the amount was £62,600, or one-sixth only of the amount for last year. In 1921-22 they contributed to the rates £174,738, while in 1913-14 they contributed £578,019, or approximately two and a-half times more than last year. These figures are striking and symptomatic.

It is further pointed out in that report that "In many cases, increased fares sanctioned by Temporary Orders were in force during the year," and that the "gross receipts were maintained at approximately the same level as in the previous year." On the other hand, "working expenses have shown a considerable reduction, and the ratio of working expenses to receipts has fallen to 82.51 per cent., as compared with 86.44 per cent. in 1920-21." Then it is significantly added that, whereas the percentage was 82.51 for 1921-22, it was 64.51 in 1913-14, which represents an increase over the pre-war figure of 28 per cent. in the ratio.

Under such conditions it is quite impossible for the public to expect a reversion to pre-war fares, and a recital of the bare facts explains why. Nothing short of a substantial reduction in working expenses can enable most of the members of this Association even to contemplate an approximation to such fares. We should aim at discarding the aid of rate-crutches. On the contrary, we should help rather than take from the heavily-burdened bearer of high local taxation in these times.

In spite of post-war fares, tramways are yet the cheapest form of transport for the industrial public. The number of passengers carried during the year 1921-22 was 4,256,268,692, a decrease of 8.86 per cent. compared with the preceding year. Compared with 1913-14, the increase in passengers carried was 28.9 per cent., but the car miles run to convey the traffic decreased by 2.02 per cent.

I need not repeat the claims of tramways to some alleviation of the financial burdens upon them—burdens forged long ago and applicable to other days. That of the maintenance of the permanent way, in particular, has occupied the careful attention of the Council, and has been the subject of a conference with the Association of Municipal Corporations during the year. The incidence of the cost is clearly inequitable in so far as tramways are concerned, and yet it seems to be impossible to remedy it without creating another and aggravated inequity upon the finances of the Corporations we represent.

In the existing conditions of industry generally in this country, unemployment insurance is of necessity a heavy tax upon all insured trades, which include tramways. Nor is there any discrimination between the burden borne by trades or industries with high and low percentages of unemployment. The large deficiency in the National Insurance fund, amounting to round about £16,000,000, precludes the establishment of a "special scheme" of insurance for tramways as a whole, even if the financial advantages outweighed the disadvantages.

Public interest has recently been further aroused by the extension of the trackless trolley system. According to the report of the Ministry of Transport, "Of the 28 local authorities who have obtained powers to work trackless trolley undertakings, nine actually carried passengers. 9,879,730 passengers were carried in 1921-22, a decrease of 755,697, or 7.11 per cent. Car miles run increased from 1,276,504 to 1,374,444, or 7.67 per cent."

The National Council, which is the common meeting ground of employers and employed, during four years of industrial strife has removed, to a large extent, at any rate, the recurring questions of wages and conditions of service from the atmosphere of local elections, and maintained peaceful relations generally. The first demands of the community, the fair treatment of the employés, the needs of the undertakings, and the economic forces at work—these alone, and not the strength of parties, should be the governing factors of the passenger transport service.

Tramways as a Municipal Asset.

By Alderman Clark, Rochdale Corporation Tramways Committee.—(*Abstract.*)

In the early stages of municipal growth the propriety of municipal trading was warmly contested. With regard to tramways for road passenger services, Parliament proceeded with great caution and very slowly, but municipal trading was pushed into prominence, and the controversy was a long one. The first movement was for the construction of tramways by local authorities, but they were denied the power to run them. Huddersfield was the first authority in the country to obtain Parliamentary powers to operate its own tramways. To-day, this is unchallenged public policy. The process of transferring tramways from private to public ownership has gone on year by year for many years past. Tramways should be self-maintaining; in Scotland it is both law and custom that tramways should be precluded from rate-aid, and there they succeed without it; so, too, it is with regard to electricity. Their tramway fares are planned with that end in view, and the principle is a sound one for a transport service.

Upon the whole, the municipal administration of tramways has been justified. They have provided the cheapest and best form of urban passenger service. They have been responsive and readily adaptable to public needs. In general, they have been commercially successful. Of course, they are the target of most public criticism, beause they are the most conspicuous of all public services. Whether the wideat or most practical use has been made of tramways may be open to question. So far, they have been, in the main, confined to passengers, but in Huddersfield, at least, they have been, and are, used to a limited extent for merchandise.

During the recent debate in the House of Commons on the London County Council (Money) Bill, the old shibboleth of "scrap the trams" was once more heard. Within a short time of that debate, the balance sheet for last year of that system was summarised on a placard in all the London County Council cars. Last year they had a balance surplus of £616,928 on a turn-over of £4,896,000 before setting aside anything for renewals, but after charging as much as £377,000 for renewals against the revenue of the year, and defraying all charges for interest and debt-redemption, there was a balance surplus of nearly £240,000. That is the most effective argument for the confusion of uninformed critics, especially when it is remembered that that system provides one of the cheapest long-distance services in the country, and probably in the world.

In many instances motor omnibuses are being used to serve as feeders in connection with tramways, a fact which should always be borne in mind when the accounts of municipal omnibuses are considered. The financial results of motor omnibus operation cannot, in any spirit of fairness, be regarded as separate entities wholly divorced from the entire combined undertaking. This leads to the wider question which lies before the Association, namely, what authority should be the custodian and operator of an urban passenger transport service? If that service must be carried on economically and with efficiency, and wholly in the public interest, it may be found that one dominant authority for a well defined area—not necessarily the area of any local authority—should be charged with that important and responsible task. The chief proposal for the solution of the traffic tangle in the Metropolitan area follows these lines. It is increasingly necessary and clear, in the public interest, that some such scheme will be needed for the provinces. As one of the great needs of the public, a social amenity that is indispensable, carrying billions of people every year, it is submitted that tramways have been, and yet are, an invaluable municipal asset.

Turning to another consideration, it is interesting to observe the proportions in which the total revenue of typical tramway systems is disbursed. Taking an average of five typical undertakings for last year, the details of which are shown in a table at the end of the paper, the following results are obtained:—

Purpose.	Shillings and pence per Pound of revenue. s.	d.
Wages, &c.	8	8
Cost of materials	1	7
Electrical energy	2	8
Local rates: in respect of permanent way		5
,, in respect of buildings ...		1
Imperial taxes		8
Other miscellaneous expenditure		10
Interest on borrowed money		11
Debt redemption charges	1	0
Rent of leased lines		7
Balance available for renewals and other purposes	2	7
	20	0

Most tramways committees have welcomed the National Council for dealing with wages and kindred questions; every month the wisdom of that policy is being justified. With industrialism in its present state, with the constant turmoil, resulting from disturbed relations between employers and employed, some such adjusting and mediating agency has become a prime necessity. Over 13 per cent. of the revenue goes in electricity and provides labour in another department. Over 3½ per cent. is absorbed by local rates, of which five-sixths is in respect of the permanent way, and this is over and above the cost of constructing and repairing it. Over 3½ per cent. is for Imperial taxation. Interest and debt charges represent 10 per cent., and the balance remaining available for renewals and so on represents 12½ per cent.

Some municipal tramways are approaching the position reached by Glasgow, and becoming practically free from debt. On the other hand, some of them have taken too long a period for the repayment of the debt on the permanent way, and are consequently compelled to borrow for its renewal, but it may be affirmed, with confidence, that from the financial point of view, if all the undertakings were brought together and treated as one great enterprise, they would give an exceedingly good account of their stewardship of public money and public convenience.

As a financial asset, municipal tramways can answer for themselves, and whatever developments there may be in the future along other lines and by other forms of passenger transport, it is to be hoped that generally speaking they will be not less successful, or less efficient.

The table accompanying the paper comprises statistics of the Manchester, Rochdale, Burnley, Bolton, and Blackburn undertakings. The allocation of each pound of revenue for each of these systems is shown, and the average appears above in the body of the paper.

BUSINESS NOTES.

Company Liquidations.—Newington Electrical Co., Ltd.—A meeting of creditors was called for August 24th at 14, Dale Street, Liverpool.

Wireless Components, Ltd.—A meeting of members is called for September 17th, at 741-743a, Salisbury House, E.C., to hear an account of the winding-up from the liquidator, Mr. C. H. Bennett.

Dissolutions of Partnership.—Ideal Electrical Supplies Co., electrical engineers and contractors, 11, Russell Street, Keighley.—Mr. J. Leach and Mr. H. W. Silson have dissolved partnership. Mr. Silson will attend to debts and continue the business.

Radio Installations, wireless installations, 52, Northcote Road, West Croydon.—Mr. R. J. Hodges and Mr. F. G. Cumming have dissolved partnership.

Bankruptcy Proceedings.—F. B. Young & Co. (F. B. Young), mechanical and electrical engineers, 45, Queen Street and 16, Restalrig Gardens, Edinburgh.—Estates sequestrated by the Sheriff of the Lothians and Peebles on August 16th. Meeting to elect trustee and commissioners August 27th at Dowell's Rooms, 18, George Street, Edinburgh; a composition may be offered at the meeting. Particulars of claims to be sent by December 17th to the agents Messrs. R. White & Co., 45, Frederick Street, Edinburgh.

G. R. Topliss, electrical engineer, 9, Palatine Chambers, Halifax.—First meeting August 24th; public examination October 12th, both at the County Court House, Halifax.

P. Rukin, electrical engineer, Manchester Road Station, Bradford.—Last day for proofs for dividend, September 4th; trustee, Mr. J. Draper, 69, Swan Arcade, Bradford.

John Henry Whitehouse, electrical engineer, 61, Martin Street, Morriston, Swansea.—The first meeting of creditors was held on August 16th at the Official Receiver's office, Government Buildings, St. Mary's Street, Swansea. According to the statement of affairs lodged the gross liabilities amounted to £2,202, of which £1,914 was expected to rank for dividend, while the net assets totalled £142, or a deficiency of £1,772. The debtor attributed his position to unfair competition, slump in prices, depreciation, illness of wife, heavy trade expenses and slackness of trade. The matter was left with the Official Receiver as trustee.

Robert Wright (trading as Robert Wright & Co.), 34-36, Oxford Street, W., electrical engineer.—The public examination of this debtor was held on Tuesday before Mr. Registrar Stiebel at the London Bankruptcy Court. The accounts showed liabilities £3,932, against assets valued at £1,286. In reply to Mr. Armstrong, Official Receiver, the debtor stated that prior to August, 1914, he was in employment as an electrical engineer; he then joined the Army and served until December, 1918, when he was demobilised and returned to his former employment. In February, 1921, he started to trade on his own account at 31, Great Titchfield Street, W., removing to his present premises in February, 1922; and in the following July he rented additional premises at 22, Cricklewood Lane, Hendon. In February last he and another person entered into a verbal partnership, and started to trade together under the style of the "Reputation Radio & Electric Co.," at 72, Merton Road, Wimbledon. Early in June a creditor levied execution at Cricklewood Lane, and the landlord distrained for rent at Oxford Street; the business was then closed, and witness had since been without occupation. He attributed his failure and insolvency to losses on contracts, to loss in trading, to loss on wireless sets that had to be dismantled in order to comply with the Government regulations, and to depreciation in the value of stock. The examination was concluded. The following are creditors:—

	£		£
Akers, A. J., & Co.	30	Johnson & Savage	23
Auckland, P. L., & Sons ...	13	Ruby, T. W., & Co.	300
Brown, J. C.	261	Mosses & Mitchell, Ltd. ...	60
Barby, N.	100	Mullard Radio Valves, Ltd. ...	103
Bowley, H. J.	32	Millas Electrical Co.	148
Carpenter, J., & Co., Ltd. ...	28	National Electrical Supplies ...	17
Credenda Conduits, Ltd. ...	14	Osborne, F., & Co.	17
Cable & Electrical Supplies ...	41	Pettigrew & Merriman, Ltd. ...	53
Duncan Watson & Co.	11	Precision Screen Co., Ltd. ...	23
Dubilier Condenser Co. ...	19	Robinson, C.	30
Dores Engineering Co.	33	St. Marylebone Electricity Supply	14
Engineering Supplies, Ltd. ...	38	Taplin, W.	1,500
Electric & Ordnance Accessories Co., Ltd.	45	Three Star Accumulator ...	15
		Tomlinson, Ltd.	53
Harrison White, M. W. ...	400	Williams & Cockerill	32
Hudson Shied & Towell	50	Walters & Sons	40
Hunt, A. H., Ltd.	28	Young, W. T.	21
Igranic Electric, Ltd.	27	Hendon Electricity Supply ...	12
Johnson & Phillips, Ltd. ...	19		

W. Hurworth and A. A. Watmough (Hurworth, Watmough & Co.), electrical engineers, 41, Town Street, Horsforth, and 1, Back James Street, Harrogate.—Trustee, Mr. H. C. Bowling, Official Receiver, 24, Bond Street, Leeds, released August 15th.

Private Arrangements.—W. Hall and J. E. Cashnells, electrical engineers, trading as W. Hall & Co., 71, Beak Street, London, W.—The creditors interested herein were called together recently, at the Chancery Lane Safe Deposit, when it was reported that the liabilities totalled £1,257, while the assets amounted to £3,533, or a surplus of £2,276. The assets consisted of book debts £566 2s. 4d., stock £2,868 1s. 9d., fixtures, &c., £61, machinery £11, and insurances £27. It was reported that the business was started by the debtor, Hall, about twenty years ago at Uxbridge, and he was able to trade successfully for many years. He carried on business alone until July, 1922, when he was joined in partnership by another man. That partnership was afterwards determined and Hall was then joined by Cashnella, who had previously been in his employ. During the early months of the present year considerable sales were effected but then the trade slumped. The drawings had been moderate. It was suggested that the debtors should be allowed to carry on the business and discharge their liabilities in full. The matter was discussed at some length and eventually it was decided that the meeting should be adjourned and that a statement of affairs should be prepared by Mr. C. Latham, accountant and auditor, 15, Eastcheap, E.C.. The following are creditors:—

	£		£
Burton, E. F. & H.	180	Power Equipment Co., Ltd. ...	193
Burndept, Ltd.	11	Precision Screw Co., Ltd. ...	16
Cort, A., & Co.	40	Shirley, Owen	23
Castle, T. L.	158	Hunt, A. H., Ltd.	103
Formo Co.	48	Pettigrew & Merriman	94
Greenslade & Brown	21	Electric Lamp Factors	11
Oldham & Son, Ltd.	60	Crystalate Mfg. Co., Ltd. ...	27
Micanite & Insulators Co., Ltd.	21	Lucas Engraving Co., Ltd. ...	16
Day, Bertram & Co., Ltd. ...	19	Stephens, J. P.	32

J. L. Cartwright & Co., electrical manufacturers and suppliers, Springfield Lane, Strangeways, Manchester.—The creditors interested herein were called together recently, when a statement of affairs was submitted, which disclosed liabilities of £8,679, made up as follows:—Trade creditors £8,380, cash creditor £209, and gas, &c., £99. The assets consisted of: Cash in hand £24; book-debts, £2,155, expected to produce £1,545; deposits, £28; shares in British Broadcasting Co., £7; stock at cost, £4,284, estimated to realise £3,213; fix-

tures and fittings, £816, valued at £557; loose tools, £60, expected to produce £30; and plant and machinery, £116, estimated to realise £87; making total assets of £5,491, from which had to be deducted £401 for preferential claims, leaving net assets of £5,090, or a deficiency of £3,589. It was reported that the business was commenced in September, 1919, with a capital of £199. It was started at small premises at London Road, Manchester, the business being that of electrical contractors. In November, 1921, a third partner joined the firm, but subsequently one of the partners retired. During 1922 additional works were obtained and the firm commenced the manufacture of wireless components. The firm was inundated with orders, which it was unable to cope with, owing to lack of accommodation, and other premises had to be acquired at Springfield Lane. During the twelve months to November, 1920, the turnover was £1,682, with a net profit of £380. In the following year the turnover fell to £1,500 and there was a profit of £114. During the 11 months to October, 1922, the turnover rose to £2,921, but there was a loss of more than £400. The present deficiency was accounted for by the depreciation written off the assets and the drawings, which had been small. It was pointed out that during the nine months to July 24th last, the turnover totalled £17,510, and there was a gross profit made of £2,178 but the trade expenses totalled £3,206. The expenses included advertising of nearly £600, and printing and stationery £473. A resolution was passed in favour of a deed of assignment being executed to Mr. A. Hodcroft, accountant, of 7, Brazennose Street, Manchester, together with a committee consisting of the representatives of the Western Electric Co. Ltd., J. Morris & Co., H. Clarke & Co., Edison Swan Electric Co., and the Varley Magnet Co. The trustee and committee were instructed to carry on the business and the debtors were given time within which to submit an offer.

C. F. Elwell, Ltd., radio engineers, Craven House, Kingsway, London, W.C.2, and Gordon Road, Peckham Rye, London, S.E.15.—In response to a circular letter issued by the company, a largely-attended meeting of the creditors of the above was held recently at the Institute of Chartered Accountants, Moorgate Place, E.C. An approximate statement was presented which showed assets of £45,000, made up as follows: Cash at bank, £1,800; stock at cost, £18,000; machinery, £2,000; trade fixtures, £1,000; loose tools, £1,500; investments, £50; book-debts, £15,000; and equity in factory, £5,000. The amount due on debentures was £13,676, and after allowing for those claims there would be net assets of approximately £31,400 available to meet the preferential creditors and the unsecured creditors of £47,000. There appeared to be a deficiency so far as the unsecured creditors were concerned of something like £16,000. The chair was occupied by Mr. J. H. Scrutton, one of the directors of the company, who stated that he was prepared to take over the claims of all creditors for £50 and less and pay them in full. Any creditor for slightly more than £50 who cared to assign his debt for £50 was at liberty to do so. He added that the position had been brought about through the slump in trade. The company had been in existence for some years and was originally formed to build high-power radio stations. Broadcasting had also been taken up and a substantial business done. The slump came like a bolt from the blue and people who owed money could not pay at once while the stock which had been accumulated could not be immediately sold. He suggested that a committee of the principal creditors should be appointed to confer with the debenture holders and the directors with a view to a scheme being brought forward in the interests of all concerned. The position was discussed at some length, during which the opinion was expressed that the products of the company were amongst the best on the market and that the business was well worth continuing. Eventually a resolution was passed appointing a committee of the principal creditors, consisting of the representatives of Fullers United Electric Co., Ltd., The Western Electric Co., Ltd., Houghton Butcher & Co., Engineering Publicity Co., Restall Brown and Co., S. G. Brown, Ltd., and Radio Valve Co. It was understood that the debenture holders would not take any action unless forced to do so by an unsecured creditor, or with the approval of the committee, until those concerned had an opportunity of considering the best course to pursue in the interests of creditors generally.

Deed of Assignment.—R. E. Beevor (R. E. Beevor and Co., and the Beaver Electrical Supply Co.), manufacturers of wireless apparatus, 109, Regent Street, and 26, Sackville Street, W.—Particulars of claims by September 12th, to the trustee, Mr. J. James, 4, Walbrook, E.C.

Trade Announcements.—The Lelios Lamp Co., Ltd., and Mr. A. de Jong have removed to larger premises at 58, Southwark Street, S.E.1. Telephone: "Hop 4827/8"; telegrams: "Jongvolt, Boroh, London."

The company, referring to its advertisement in our last issue, informs us that the words in parentheses (sole agents for Great Britain and Ireland for Philips lamps) apply only to Mr. de Jong; the Lelios Company does not supply any Philips lamps.

The Sturdy Engineering Co., 40, Charterhouse Chambers, Charterhouse Square, E.C.1, informs us that it has completed arrangements for factoring electrical apparatus on a fairly large scale, and will be glad to receive catalogues from manufacturers, especially those making domestic appliances.

The Keighley Gear Cutting Co., of Fleece Mills, Keighley, has moved to more commodious premises. The new address is Aireworth Works, Aireworth Road, Keighley.

Messrs. Hambling, Clapp & Co., Ltd., radio specialists, have removed from 110, Strand, to larger premises at 11, Agar Street, Strand, W.C.2.

The Imperial Engineering Co. has appointed Messrs. Daniel Carmichael & Sons, 125, Howard Street, Glasgow, as its sole agents for Scotland and the Northern Counties.

Catalogues and Lists.—British Insulated & Helsby Cables, Ltd., Prescot, Lancs.—Publication No. P. 180, containing particulars of aluminium matting, extruded aluminium sections, and aluminium and copper sheets.

The Midland Electric Manufacturing Co., Ltd., Barford Street, Birmingham.—An illustrated and priced pamphlet dealing with a new line of quick-make and break switches.

Northumbria Motors, Ltd., Mill Street East, Dewsbury.—An illustrated booklet containing details and prices of one-, two-, and three-phase electric motors.

Messrs. Charles Churchill & Co., Ltd., 9-15, Leonard Street, Finsbury, E.C.2.—A leaflet containing an illustrated description of the "Invincible" die-casting machine for white-metal alloys.

Messrs. Watson & Sons (Electro-Medical), Ltd., Sunic House, Parker Street, Kingsway, W.C.2.—Bulletin 295, dealing with "Sunic" diathermy apparatus. Priced and illustrated.

The British Thomson-Houston Co., Ltd., Rugby.—Price List No. 5113, describing series-parallel air-break starting switches for two-phase squirrel-cage motors; and Descriptive List 5301A, dealing with d.c. motor-control panels.

Messrs. H. G. Osborn, Ltd., 9, Rathbone Place, W.1.—A net trade price list of electrical supplies, including wiring materials, lighting fittings, switches, fuses, &c.

The Lelios Lamp Co., Ltd., 58, Southwark Street, S.E.1.—Two priced leaflets dealing with electric lamps of Dutch manufacture.

Sterling Telephone & Electric Co., Ltd., 210-212, Tottenham Court Road, W.1.—Publication No. 363, a priced and illustrated pamphlet dealing with "Magnavox" gramophone and voice-amplifying outfits.

Newalls Insulation Co., Ltd., 4, Mosley Street, Newcastle-upon-Tyne.—An illustrated pamphlet describing "Magnesia Plastic" insulating material for boilers, steam pipes, &c.

The British Mannesmann Tube Co., Ltd., 67, Queen Victoria Street, E.C.4.—An illustrated booklet advertising lap-welded steel pipes for hydro-electric schemes, sewerage, steam, and other purposes.

Mr. Frederick Pratt, 66, Victoria Street, S.W.1.—A number of illustrated and priced pamphlets advertising glassware for lighting purposes.

Mr. A. Hinderlich, 1, Lechmere Road, Willesden Green, N.W.2.—A pamphlet giving prices of accessories and materials for radio-telephone sets.

Messrs. Edward Matthews, Ltd., Bradley, Bilston, Staffs.—An illustrated pamphlet dealing with cable-joint boxes.

The Bordesley Electrical Accessories Co., Ltd., 162, High Street, Bordesley, Birmingham.—A comprehensive catalogue of electrical appliances, accessories and materials. Illustrated and priced.

The Imperial Engineering Co., Electric House, Grape Street, Shaftesbury Avenue, W.C.2.—A priced and illustrated folder advertising electric fires, irons, toasters, and other domestic appliances.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., Blomfield Street, London Wall, E.C.2.—List UM 1, an illustrated publication dealing with joint-box compounds and accessories for the preparation and application of these. Priced.

New French Telephone Co.—La Société des Téléphones, Système Picart et Lebas, is the name of a new company which has lately been formed at Lt Bossissière with a capital of 3,000,000 fr.

Holidays.—Messrs. Fleming, Birkby & Goodall, Ltd., Liversedge, Yorks., announce that their works and offices will be closed for the annual holidays from September 1st to September 8th (both days inclusive).

Russian Orders.—It is reported from Prague that the local iron trading firm of Kern & Co., acting on behalf of the Witkowitz Steel Company and the Brunn Machinery Works, has entered into an agreement with the Soviet Government for deliveries to the value of millions of Czecho-Slovakian crowns. The orders concern the supply of boilers and steam turbines for four central stations in the neighbourhood of Moscow and Nijni-Novgorod. A part of the orders has been given firm, while a decision with regard to the other part has been reserved. It is stated that the Government received tenders for the deliveries from 18 firms in different countries.

Book Notices.—"Stories of Scientific Discovery," by D. B. Hammond. Pp. x+199; illustrated. London: Cambridge University Press. 6s. net.

"Second Report of the Miners' Nystagmus Committee (Medical Research Council)." Pp. 33. London: H.M. Stationery Office. Price 9d. net.—This report is a study of the disease itself and does not deal with causes.

"Electric Wiring Tables," by W. Perren Maycock, M.I.E.E. (Fourth Edition). Pp. 95. London: Sir Isaac Pitman & Sons, Ltd. Price 3s. 6d. net.—Among the revisions which have been made by Mr. F. C. Raphael, M.I.E.E., in this new edition may be mentioned the insertion of the new wire and cable standards; the alteration of the cable "ready reckoner" to deal with lengths of 100 and 1,000 yd. instead of 110 and 1,760 yd., as in previous editions; the substitution of metal filament lamps for carbon lamps in the tables dealing with this matter; and the modification of the motor tables to facilitate wiring calculations.

Messrs. Henry Frowde and Hodder & Stoughton have sent us a complete list of this year's "Oxford Technical Publications," which cover many arts and sciences.

"Memoirs of the College of Science, Kyoto Imperial University," Vol VI, No. 6. Kyoto: Maruzen Co., Ltd. Price 1 yen.—This issue contains five papers treating of chemical and mathematical subjects.

"The Technology Reports of the Tôhoku Imperial University," Vol. III, No. 3. Sendai: Maruzen Co., Ltd. Included in this issue are two papers on artificial electric lines, and one upon the stresses in internal-combustion engine cylinders.

Trade Commissioner at Calcutta.—Mr. W. D. Montgomery Clarke has been appointed Trade Commissioner (Grade II) at Calcutta.

Paraguay's Foreign Trade.—A report of the United States Department of Commerce shows that the imports of electrical goods into Paraguay during the years 1921 and 1922 were respectively 60,575 and 25,090 gold pesos. Of these totals British goods represented 12,397 and 1,625 gold pesos, but as Argentina is shown as the largest exporter it is probable that Great Britain had a larger share in this trade. The United States was behind Great Britain in 1921, but gained a higher position in the following year. As regards the total imports Great Britain held the second place to Argentina in the last two years, followed by the United States, which occupied the second place in 1920.

British Trade-mark Applications.—The following are among the recent applications for British trade marks. Objections to any of the applications may be entered within one month from the dates mentioned:—

Crystophone. No. 427,295. Class 8. Apparatus for use in wireless telegraphy and telephony. Sydney L. Forbes, 5, Edwardes Place, Kensington, W. August 1st, 1923.

Nocturne, Music from the Stars (lettering and design). No. 436,307. Class 8. Wireless telephone sets, loud speakers, &c. William T. Ryland, 19, Hillaries Road, Erdington, Birmingham. August 1st 1923.

Minimax. No. 437,674. All goods in Class 8. Minimax, Ltd., Staines Road, Bedfont, Middlesex. August 1st, 1923.

The Eurekaphone (lettering and design). No. 437,843. Class 8. Wireless telephonic apparatus. The Electric Appliances Co., Ltd., 8, Fisher Street, Southampton Row, London, W.C. August 1st, 1923.

Gewatta. No. 437,830. All goods in Class 8. Tom Taylor, Victory Villa, Kings Barn Road, Steyning, Sussex. August 1st, 1923.

Permanite. No. 438,341. Class 8. Crystal detectors for use in wireless telephony. A. W. Gamage & Co., Ltd., 118-128, Holborn, London, E.C. August 1st, 1923.

Memak. No. 434,344. Class 13. Electric switches, electric fuses and electric cut-outs. The Midland Electric Manufacturing Co., Ltd., Stafford Works, Barford Street, Birmingham. August 1st, 1923.

Fullolite. No. 436,577. Class 13. Electric lamps. The Edison Swan Electrical Co., Ltd., 123-5, Queen Victoria Street, London, E.C. August 1st, 1923.

Sunblaze. No. 438,581. Class 18. Electric and gas stoves and radiators. Herbert H. Berry, 86, Newman Street, London, W. August 1st, 1923.

Ideal, Wates Bros. (lettering and design. No. 437,257. Class 8. Electric accumulators and batteries. Frank S. S. Wates, trading as Wates Bros., 13-14, Great Queen Street, London, W.C. August 8th, 1923.

Amplion. No. 438,576. Class 8. Telephonic apparatus. Edward A. Graham, trading as Alfred Graham & Co., St. Andrews Works, Crofton Park Road, London, S.E.4. August 8th, 1923.

Moroccan Information Available.—The Vice-Consul at Casablanca, Morocco (Mr. C. G. Hope Gill) who is now on a visit to the United Kingdom, will be pleased to interview firms interested in trade in Morocco (Tangier and Casablanca districts) at the Department of Overseas Trade during the mornings of August 24th, 25th and 27th.

British firms who desire to take advantage of this opportunity are requested to communicate with the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, S.W.1, quoting Ref. 4879/TG.

The Trade of Southern Rhodesia.—Statistics published in the *Board of Trade Journal* show that the value of goods imported into Southern Rhodesia in 1922 declined considerably as compared with 1921 values. Machinery imports amounted to £190,980 as against £361,959, and railway and tramway materials (including locomotives) declined in value from £619,579 to £272,235. Exports were slightly lower in value but about £800,000 in excess of imports. Raw asbestos to the value of £287,744 was exported; in the previous year the figure was £431,028.

Country House Lighting.—A useful booklet has been published by Messrs. Mann, Egerton & Co., Ltd., containing illustrated notes upon the design and upkeep of electrical installations in country houses. Although it is frankly an advertisement of the company's plant the publication contains a large amount of information of interest to the non-technical man who contemplates an installation. Electrical terms are briefly explained, and there is even a smaller section upon the measurement of water power. The care of engines, generators, and batteries is also dealt with.

British Empire Exhibition Notes.—According to the *Times Trade and Engineering Supplement* one of the exhibits in the South African section of the exhibition will be a complete electric train and locomotive. A special feature will be made of the Natal railway electrification, which will be illustrated by models and photographs.

Burnley Corporation has decided to contribute towards the cost of the display being arranged by the British Electrical Development Association.

The Labour Party has communicated with the Labour groups of the Dominions and Colonies with reference to the holding of an Empire Labour Conference in connection with next years's Exhibition. It is anticipated that a sufficient number of favourable replies will be received to enable the proposals to be acted upon.

Lectures on Management and Industry.—Under the auspices of the Industrial League and Council a series of lectures on management and industry will be given at the Polytechnic, Regent Street, W., during the winter season. The programme is as follows:—

October 12th, Opening Address: "Management and Industry—the Need for Knowledge," by the Rt. Hon. G. N. Barnes, P.C., and Mr. W. L. Hichens; October 26th, "The Financial Organisation of Industry," by Mr. A. W. Kimberley; November 16th, "Industrial Research," by Mr. A. P. M. Fleming, C.B.E.; November 30th, "Factory Management," by Mr. A. R. Stelling, F.C.W.A.; December 14th, "The Relative Rewards of Capital, Management and Labour," by Mr. H. Atkinson, M.I.Mech.E.; January 11th, 1924, "Motion Study and Fatigue Study; The Fundamentals of Economic Production," by Mr. James F. Butterworth; February 8th, "The Safeguarding of Health in Industry," by Dr. Edgar L. Collis, M.A.; February 22nd, "The Economic Aspect of Cost Accountancy," by Mr. H. W. Allingham, M.I.Mech.E.; March 7th, "The Attitude of Labour to Problems of Industrial Organisation," by Mr. F S. Button, J.P. The fee for the whole course is 5s.; single lectures 1s. Tickets may be obtained from the Polytechnic, the Director of Education, or the Industrial League and Council, 82, Victoria Street, S.W.1.

The Boilermakers' Lock-out.—This dispute has now been in progress for sixteen weeks, but still the members of the Boilermakers' Society refuse to return to work under the conditions contained in the general agreement arrived at between the Shipbuilding Employers' Federation and the Federation of Engineering and Shipbuilding Trades. The society has announced its determination to continue the dispute through the winter if necessary, but it is reported that, unless an early settlement is reached, 60,000 other workers will be thrown out of employment.

Lead Market Report.—Messrs. James Forster & Co. report, on August 18th: Closing prices yesterday were £24 for August and £24 for November, against £24 and £23 15s. respectively at the end of last week. Consumers have plenty of lead in the river, which will be available as soon as the strike is settled. There seems to be little prospect of a shortage of arrivals of lead for the next six weeks at any rate. The Board of Trade returns for July are: Imports, 12,012 tons; exports, 1,069 tons; leaving for home consumption 10,943 tons.

Italian Tariff Modifications.—The *Board of Trade Journal* for August 16th contained as a supplement a translation of the schedule containing revisions of the general tariff established by Royal Decree in June, 1921. In general the alterations are in the nature of reductions, these being effected by the insertion of a smaller "co-efficient of increase." It is noted that numerous items are not applicable in the case of goods from the United Kingdom, these being covered by special arrangements. Included in this class are generators, motors, transformers, boilers and the majority of steam engines, rotary and reciprocating. Among the items which are not subject to this qualification are electric geysers and cookers, tramway vehicles, locomotives, telephone and telegraph apparatus, electric lamps, insulated tubes, and electro-medical apparatus.

An Unsolicited Testimonial.—In dispatching a hot-plate to the Jackson Electric Stove Co., Ltd., for repair, one of the company's clients states: "This has been taken from an electric cooker you supplied to us a matter of ten years ago, and it may interest you to know that this cooker has been in continual use for a family for the whole of that period, and this is the first repair in any way that has been required."

Conditions in Western Ontario.—Following an official tour through Western Ontario, Mr. F. W. Field, Trade Commissioner at Toronto, reported recently to the Department of Overseas Trade upon conditions in that area. To escape the Canadian tariff and enjoy the preferential treatment accorded within the Empire to Canadian goods, many American firms have opened branch factories. It was estimated that at the end of 1922 there must have been over 700 of such establishments in Western Ontario. A number of British manufacturers are contemplating a similar course. Referring to the production of power at the Niagara Falls, the Commissioner states that a prominent company at Chippawa proposes to enlarge its electric furnace plant, at a cost of $165,000, to provide for the manufacture of a carbide of silicon abrasive known as "Crystolon."

Business conditions are stated to be improving gradually. There is keen competition with British manufacturers from Canadian and United States manufacturers, and in certain lines France, Belgium, Sweden and Japan are active.

It is considered that there appears to be scope for increased sales of machinery of various makes in this market, including air compressors, hoisting machinery, mining equipment, textile machinery, and various other lines in which United Kingdom manufacturers have proved specialists. Three of the factors operating against greater business are the lack of sufficient local representation and active salesmanship, the failure of United Kingdom manufacturers to keep in constant touch with those who have purchased their machines, and the inability to effect repairs at short notice. Joint representation of non-competitive manufacturers, with a technical man to look after repairs, is suggested, as well as a stock of the spare parts which are most likely to be needed. A personal visit by manufacturers is again recommended.

American Capital for Australia.—There are prospects of American money being launched in Australia to establish great enterprises on the Pacific coast of the Commonwealth, says the *Melbourne Age*. The opening up of Port Stephens, in New South Wales, where extensive purchases of land are reported to have been made in American interests, is part of the scheme. Ports on the Eastern coast of Queensland are also being discussed in connection with United States trade with Australia and the East. During the last few weeks several representatives of large financial and mercantile concerns in the United States have visited Queensland. Their mission, according to voluntary statements, is to investigate the possibilities of trade expansion in this part of the world.—*Reuter's Trade Service* (Melbourne).

Russian Electrical Progress.—According to the *Ekonomitcheskaya Zhism*, in the third quarter of the current working year the electrical industry of Russia reached 48 per cent. of its pre-war production. The first place is occupied by the lamp industry, which exceeds the pre-war production by 55 per cent. The next most successful branch has been the cable industry, with 66 per cent. of pre-war production. The insulator branch represented 53 per cent., and "weak current" products 34 per cent. The production of accumulators occupied the lowest place. The production by Russia's electrical industry during the first nine months of the current working year (October-June) amounted to 18,523,000 pre-war roubles in value, which was much in excess of the output in the preceding working year, which was valued at 14,950,000 pre-war roubles.

E.D.A. Activities.—The latest pamphlet issued by the British Electrical Development Association (E.D.A. 387) advises the use of electric light to "keep the summer sun a-shining in your home on the chilly days and dismal nights of winter."

Local Exhibitions.—Rawtenstall.—The borough electrical engineer (Mr. C. L. E. Stewart) notifies us that the Corporation is holding an exhibition of domestic electrical appliances in the Theatre Arcade from September 8th to 15th inclusive. Cooking demonstrations will be given by exhibitors, who will receive energy for the purpose free of charge.

Liverpool.—The Electric Lighting Department of the Corporation has arranged for a demonstration of electrical appliances for cooking, cleaning, washing, drying, &c., to be given at premises in Parker Street, between September 3rd and September 22nd.

Walsall.—We are informed by the E.D.A. that an exhibition in which electricity will take a considerable part is to be held in the town from November 5th to 10th.

Foreign Exhibition.—Belgium.—The scheme for the holding of an Exposition Internationale d'Electricité et des Industries connexes at Brussels in July 1925, has taken definite shape, says the *Bulletin de l'Electricité*, to which the scheme is due, it having received the support of numerous societies and *chambres syndicales*. Steps have also been taken to secure Government support or patronage as in the case of previous exhibitions.

For Sale.—By order of the receiver of the debenture holders of J. H. McBean, Ltd., electrical engineers, Clarence Mills, Bradford Road, Batley Carr, Messrs. W. Coates & Son will sell by auction, on the premises, on August 27th, the whole of the machinery (including several electrical items), stock-in-trade, office furniture, &c. (See our advertisement pages to-day).

LIGHTING AND POWER NOTES.

Banbury.—Electricity Charges.—The Town Council recently approached the Banbury and District Electric Supply Co. with a view to obtaining a reduction in the charges for electricity. The company informed the Council that no reduction could be made at present, but the matter would receive consideration at the close of the current financial year.

Bethesda (North Wales).—Proposed Electricity Scheme.—A recent public meeting of ratepayers decided to urge the Council to proceed with an electricity scheme. A canvass of householders is to be taken.

Blackpool.—Bulk Supply.—The Corporation has agreed to give a bulk supply of electricity to Lytham-St. Annes, and application is to be made to the Electricity Commissioners for sanction to borrow £10,000 for the purpose.

Bulkington (Nuneaton).—Electricity Supply.—The Urban District Council has accepted an offer of the Leicestershire and Warwickshire Electric Power Co. to supply electricity to the district, and the company states that the work will be put in hand immediately.

Canada.—Water-power Concession.—A contract between the Provincial Government and the Des Quinze Power Company, of Ontario, for the 60-year lease of the third group of rapids of the Des Quinze river has been signed. The conditions provide for an annual rent of $80,100, the collection of 50 cents per horse power exploited, and an additional 50 cents per horse power exported from the province. This tax will apply to power furnished to the adjacent gold mines of Northern Ontario which, at least for some time to come, will be the sole customers for the company's output.—*Reuter's Trade Service* (Quebec).

Chorley.—Commencement of Supply.—The supply of electricity by the Lancashire Power Co. commenced on August 15th. There are over 70 consumers connected to the company's mains. The inauguration of supply was celebrated by a dinner, and at a later date it is proposed to arrange a municipal function.

Clitheroe.—Electricity Supply.—The Rural Council has been informed that there is a proposal afoot to establish a power station at Padiham, and to carry the main to Clitheroe through the Nick of Pendle (a hill in the district). Clitheroe Corporation has called in an expert to prepare a scheme for the borough, for it desires to be in a position to deal with the new station or negotiate with Blackburn Corporation. The question has resolved itself into one of terms. The Council has decided to object to the project for carrying the main by way of Pendle, and suggests that it should be brought through Whalley and Barrow, and then extended to Chatburn, thereby providing the village with much-needed power.

Continental.—Russia.—The repair of the central power station at Kieff is proceeding rapidly after many years of neglect, and it is expected to be completed this autumn, including the boilers, the furnaces of which are to be adapted to the consumption of peat and sawdust. The station is expected then to carry its full load.

Sweden.—According to a recently-published report by a Government Committee, upon the supply of electricity in rural districts, there is now a total area of about 3,700,000 acres of arable land, nearly half the total cultivated area, supplied with electricity. The work done in this connection represents a total investment of 200 million kr., and the annual cost varies between 25 and 30 million kr.

The Forss Aktiebolag, which owns sawmills and pulp mills, has decided to construct a large modern water-power plant at a cost of kr. 700,000, to be completed in 1924.—*Reuter's Trade Service* (Stockholm).

Belgium.—According to a report, published in the *Neptune* of recent date, forwarded to the Department of Overseas Trade by the Commercial Secretary at Brussels (Mr. J. Picton Bagge), the Provincial Government of West Flanders, following the lead of the other provinces, is now considering the electrification of its townships, many of which are still without electric light. Out of the 242 townships in the province, 94 are provided with gas and 59 have electricity.

Two methods of working the scheme are to be considered:—

1. For the devastated regions, the province would provide high-pressure lines from the power station to the township. The provincial Government would buy the energy from the power station, carry it to the township and sell it to the local company holding the concession. The first line on which this method might be tried would run from Ostend to Furnes, Dixmude, and Gits, over a length of 198 km., supplying 46

townships. The cost is estimated at 6,000,000 fr. A second line 57 km. in length would go by Ramscapelle, Leke and Pollinchove, supplying 22 townships, and would cost 1,725,000 fr. Altogether the installation of the system in the devastated regions would cost 7,725,000 fr., and ensure the supply of electricity to 68 townships with a total population of 114,400.

2. The intervention of the entire province in the installation costs of low-pressure current would amount to one third, or 7,115,000 fr.

Altogether the total electrification of the province will cost about 15,000,000 fr.

Denmark.—Plans have been formulated for increasing the capacity of the H.C. Oersted power station belonging to the municipality of Copenhagen by the addition of two 15,000-kW turbo-generators and boiler plant. Owing to financial stringency, however, only half of the extension, costing over 6,000,000 kr., is to be proceeded with at present.

Dewsbury.—Year's Working.—The Corporation electrical undertaking (engineer: Mr. R. W. Grubb) earned a net profit of £9,275 during the year ended March 31st last. In the previous year the profit was £3,258.

Darfield (Yorks.).—Street Lighting.—Concern was expressed at a recent meeting of the Wombwell Urban Council regarding the proposal of the Darfield Council to light the streets of the district by electricity, as Darfield is a consumer of the gas produced by the Wombwell Council. A reduction in the charges for gas was suggested.

Formby.—Electricity Scheme.—Mr. James Scott, electrical engineer of Bootle, has been appointed by the Urban Council to proceed with an electricity scheme for the township. The Council has decided to obtain tenders and make application to the Electricity Commissioners for sanction to loans.

Frinton-on-Sea.—Inquiry.—On August 13th, Col. T. C. Ekin, on behalf of the Electricity Commissioners, held an inquiry into the application of the Frinton-on-Sea Electric Light and Power Co., Ltd., for permission to increase its maximum charge from 7d. to 1s. per kWh. The application was opposed by the Urban District Council, the local Tradesmen's Association, and a number of consumers. Mr. A. T. Thomas, the company's accountant, said that unless the application was approved it would be impossible for the company to render efficient service, as it would not have sufficient funds to ensure proper maintenance. The 1922 balance-sheet was produced, showing that out of a net income of £2,586, £1,000 had to be put to depreciation account. Objection was made by several of those present to the meter rent of 4s. per quarter charged by the company, but Mr. Thomas said that if an increased charge were allowed meter rents would be reduced. After closing the inquiry, Col. Ekin inspected the company's works.

Glasgow.—Popularising Electricity.—Among the recommendations made by the Propaganda Sub-Committee of the Electricity Committee for the popularisation of electricity amongst domestic consumers are suggestions that radiators and heaters be let on hire at rentals ranging from 9s. to 15s. per annum, and cookers at £1 for the first year and 10s. per annum thereafter.

Electricity District.—A special joint sub-committee of the Corporation's Tramways and Electricity Committees on August 15th considered recommendations with regard to the projected West of Scotland Electricity District. It was decided to request that the members representing the Corporation on the Advisory Board should be increased from three to five. It was also agreed that a paragraph relating to the erection of new generating stations should be amended by inserting therein words to the effect that a new generating station be erected by the Corporation on a site immediately to the west of the city, to meet the city's requirements in the near future.

Grange (Lancs.).—Electricity Charges.—When the question of extending the tenure of premises occupied by Messrs. Wilkinson, Ltd., who supply electricity in the district, came before the Urban Council recently, the matter of electricity charges was raised. It was decided that the firm should be informed that the price of electricity must be reduced from 1s. to 9d. per kWh before the extension of tenancy is considered.

Guildford.—Workhouse Lighting.—The Board of Guardians has appointed a committee to consider the question of a supply of electricity for lighting and power at the institution. The borough electrical engineer estimates the total cost at £625.

Halifax.—Failure of Supply.—The *Halifax Courier and Guardian* states that the current at the Corporation electricity works "went off" about 1.15 p.m. on August 14th. As a result, the tramway services were brought to a stoppage, and a suspension of work was enforced at works using power. Few concerns were running owing to the Wakes. The current remained off for about 20 minutes.

Holmfirth.—Electricity Charges.—The Urban District Council has decided to apply to the Electricity Commissioners for an Order authorising it to continue the price of electricity at 9d. per kWh.

Hereford.—Rural Supply.—At a recent meeting of the City Council it was reported that the revenue from the rural supply scheme for the June quarter was £1,398, as compared with £646 in the June quarter of 1922. The improvement was said to be due to the demand of the Lydbrook Cable Co., and it was stated that every effort would be made to oppose the application of the West Gloucestershire Power Co. for supply rights in the Lydbrook district.

Leigh (Lancs.).—Loan.—The Town Council is applying to the Electricity Commissioners for sanction to borrow £37,572 for various electricity purposes.

London.—Southwark.—It is reported that the result of working of the electricity undertaking during the past financial year was a net profit of £16,565. Of this amount £10,000 is to be contributed to the relief of rates.

Macduff.—Proposed Electricity Supply.—As Mr. J. A. Bell, the Aberdeen Corporation electrical engineer, reports that the cost of an electricity supply scheme would now be much less than when the question was first mooted, the matter is again to be raised, and the Town Council is communicating with the Banff Town Council with regard to a joint scheme.

Market Drayton.—Public Lighting.—The Urban District Council has accepted the tender of the electric light company for the lighting of 90 or more lamps from September, 1923, to April, 1924, at £3 10s. per lamp.

Morocco.—It is reported from Casablanca that the official bulletin of the protectorate has published the convention signed in 1917, granting to 23 French companies a concession until 1999 for the production, transmission, and distribution of electrical energy throughout Morocco by means of the establishment of hydro-electric works utilising the falls of the Oum-el-Rebia and its tributaries. Among the interested undertakings are mentioned the names of the Société Alsacienne, the Compagnie Thomson-Houston, and the Compagnie Schneider.

Newport (Isle of Wight).—Electricity Charges.—The Ministry of Transport has authorised the Isle of Wight Electric Light & Power Co. to continue the existing maximum prices for electricity. The company had asked for permission to increase the maximum charges.

Newport (Fife).—The Wormit Undertaking.—At its meeting on August 14th, the Town Council decided not to purchase the Wormit electric lighting undertaking. This was carried on by the Tayside Electric Lighting Co. for several years, but as it proved consistently unremunerative it was recently closed down.

Northern Ireland.—Donegal.—The District Council has disposed of its gas plant and has decided to invite tenders for the lighting of the streets by electricity.

Oldham.—Year's Working.—The report of the borough electrical engineer (Mr. F. L. Ogden) for the year ended March 25th last shows that the revenue of the electricity undertaking amounted to £188,184, as compared with £169,138 in 1921-22. Against this was charged a working expenditure of £101,770, as compared with £124,664, leaving a gross surplus of £86,414 (£44,474). The final result was a profit of £23,148, as against £1,403 in the previous year. This balance was carried forward to the next account. The capital account shows an expenditure of £92,889 during the year. The bulk of this amount was spent on buildings, machinery and plant (£45,550), and mains and services (£38,629). The total amount spent on the undertaking at March 25th was £908,849.

The amount of energy sold increased from 22,245,947 kWh to 29,832,893 kWh, an improvement of 34 per cent., mainly due to an extra 6,500,000 kWh supplied for power purposes. The maximum simultaneous load was 16,206 kW, as compared with 14,650 kW in 1921-22. During the year a 6,000-kW turbo-alternator, two 1,500-kW rotary converters, and two 35,000 lb. per hour boilers were added to the plant.

Paisley.—Year's Working.—The report of the Electricity Committee upon the working of the electricity undertaking for the year ended May 15th states that the total income was £79,942, as compared with £85,014 in 1921-22. The working expenses amounted to £44,362, as against £48,913, leaving a gross profit of £35,380 (£36,101). After the payment of interest and sinking fund charges there remained a net profit of £2,511, the whole of which was placed to reserve. In the previous year there was a profit of £4,686. The capital expenditure during the year was £17,500, principally for mains and services. The sales of energy totalled 7,944,402 kWh, an increase of 13 per cent. Additional connections representing 1,276 kW were made during the year, and the Corporation now has over 10,000 h.p. of motors connected to its system.

Perth. — Year's Working. — The Corporation electricity department has had a satisfactory year, the gross profit being £10,914. Lighting charges have been reduced 15 per cent. and power charges 10 per cent.

Pickering (Yorks.).—Electricity Scheme Impracticable.—A committee of the Urban District Council has considered the adoption of a public electricity scheme but has decided, in view of the high rate of interest now charged for public loans and the improbability of a large demand at present, that there is not sufficient hope of the scheme paying to justify the committee in taking action.

Price Reductions.—Reductions in the charges for electricity have been made in the following districts:—

Stretford.—Lighting: From 6d. to 5½d. per kWh, with a proportionate reduction on the kW charge. Domestic heating and cooking: From 1d. per kWh, plus 65 per cent., to 1d. per kWh, plus 57½ per cent. Power: War advance of 65 per cent. reduced to 57½ per cent.

Southwark.—Lighting: First 1,200 kWh per quarter, from 7d. to 6d. per kWh.

Yarmouth.—General decrease of 10 per cent. Tramway supplies, 1.75d. per kWh for the first 500,000 kWh, and 1.6d. per kWh thereafter.

Retford.—Electricity Supply.—The Rural District Council is offering no opposition to the application of the Sheffield Corporation for powers to supply electricity in the district.

Rhyl.—Electricity Supply.—The Council has completed an agreement with the North Wales Power Co. for the supply of electricity to the town, and sanction is to be sought to the borrowing of £1,700 in addition to the £7,463 already applied for.

Royton.—Electricity Supply.—The Oldham Electricity Committee has informed the Council that work has commenced on the provision of an electricity supply to the district, and it is hoped that energy will be available before the coming winter.

Rugeley.—Commissioners' Objection to Scheme.—The Electricity Commissioners have communicated with the Urban District Council deprecating the establishment of small electricity undertakings when one scheme would cater for the whole district. A committee which had been considering a scheme for supplying the town with electricity, had approached the Commissioners for information as to the steps to be taken to undertake a scheme, and also suggested that a communication be forwarded to Cannock Urban District Council stating that Rugeley should be left out of its electricity scheme. The Urban District Council has referred the question back to the committee.

Rushden.—Street Lighting.—The Urban Council has decided to have 39 gas lamps converted for electricity. The Electric Light Co. has undertaken that the charge for electricity shall rise and fall in correspondence with the prices charged to other large consumers.

Scarborough.—Special Lighting.—A committee of the Corporation has under consideration a scheme for lighting by electricity a part of the foreshore extending from the West Pier to the Aquarium with strings of electric lamps over certain sections.

South Africa.—Johannesburg.—Reporting upon the recent fire which occurred at the municipal power station, Mr. Sankey, the Council's electrical engineer, states that a short-circuit in a main switch, due to a pressure surge and, probably, defective insulation, ignited the contents of the oil chamber, which burst and spread the blazing oil in all directions. None of the employés was near the switch, and so no personal injury was caused, but the whole of the generators were temporarily put out of commission. The Council decided to accept an offer of the Cape Town Corporation to supply a suitable switch at a cost of £548.

Special Orders.—Confirmation by Minister of Transport.—The Minister of Transport has confirmed Special Orders made by the Electricity Commissioners in respect of the following districts:—Elgin (Electric Supply Co., Ltd.); Exmouth (Electric Supply Corporation, Ltd.); Gourock (Burgh Council: to be transferred to Greenock Corporation); Mold, Flint (Urban District Council); and Northampton (Corporation: extension of supply to parishes in the rural districts of Wellingborough and Overstone).

Orders in respect of the following districts have been made by the Commissioners and submitted for confirmation to the Minister of Transport: Malmesbury, Wilts (Western Electric Distributing Corporation, Ltd.); and Wickford, Essex (Wickford & District Electricity Supply Co., Ltd.).

Steyning.—Public Lighting.—The Parish Council has accepted the tender of the Electric Light Co. for public lighting.

Thetford.—Water-power Scheme.—The Town Council has received from its consulting engineer, Mr. R. H. L. Lee, A.M.Inst.C.E., a report upon the project for utilising the power of the Little Ouse for generating electricity for Thetford and Brandon. He estimates that a 750-h.p. turbine plant, with a 150-h.p. oil-engine-driven stand-by set, would cost £38,785, and would be able to meet all the requirements of the two townships. The cost of an installation of 480 h.p., with a 150-h.p. stand-by plant, is put at £33,021. Sundry other expenses would raise the initial cost of the two schemes to £41,800 and £35,500 respectively. Mr. Lee considers that the scheme would be remunerative within three years of its inauguration.

Thurles (Co. Tipperary). — Electric Lighting. — The Urban Council is carrying out an electric lighting scheme and good progress has already been made.

TRAMWAY AND RAILWAY NOTES.

Australia.—New South Wales.—The recently-issued report of the Railway Commissioners covering the past year's working shows that the tramway revenue was £3,598,114, the working expenses £3,092,306, and the interest charges £500,274, leaving a net surplus of £5,534. The railways earned a net profit of £84,000; in the previous year there was a deficit of £127,000.

Canada.—Proposed Railway to United States.—According to the *Electric Railway Journal*, negotiations between the Canadian Government Railway Department and the company operating the Aroostook Valley Railroad have reached a point which makes the proposed Quebec electric extension line across the northern part of the State of Maine seem a practical certainty. The scheme projects the construction of a line from La Fontaine (Que.) to Washburn to connect the two systems. The total length would be 120 miles, of which 100 miles would be on the United States side of the border. A rough estimate places the cost at $4,000,000.

Montreal.—*Commerce Reports* states that the annual increase of 30 per cent. in the traffic of Montreal has rendered increased facilities urgent. The city tramway company contemplates the purchase of 50 new cars. The street railway lines offer no scope for extension, and the installation of a subway system has been suggested.

Continental.—Esthonia.—The Council of the Railway Administration at Reval has approved of the estimate for the electrification of the railway line from Reval to Nomme and for some new construction necessary for carrying out the whole project. The costs are estimated at 34 million Esthonian marks. The *Ost Express* learns that the director of the works department of the railway administration, M. Tanstein, has gone to Germany to make preparations for the execution of the project. He will visit Düsseldorf and Goerlitz, where such electric railways are running. An order for motors has already been placed by the administration with Messrs. Siemens-Schuckert.—*Reuter's Trade Service* (Reval).

Spain.—The Guadarrama electric railway was recently opened by the King and Queen of Spain, and its 11 km. of track is the first stage of the opening up of a very picturesque district to tourists. There being no possibility of utilising water power for the generation of electricity a 500-h.p. Diesel engine was installed in the power station.

A concession has been secured by Don Manuel Orencio Valdes, of Gijon, for the construction of an electric tramway to run from Gijon to Granda.

The *Gaceta de Madrid* contains notices of two applications for concessions for the construction of electric tramways, the former, by Don Pablo Hernandez Rozpide, for a network of lines in Barcelona, and the latter by the Compañia de Tranvias de Sevilla, for a number of extensions in Seville.

It is stated that the Banco Espanol de Crédito has obtained a concession without any guarantee of interest or subsidy for the construction of a new underground railway in Madrid, comprising one line from the Plaza de Canalejas to the Northern railway station, and a second line from the former point to the Asilo de la Paloma. The scheme has no connection with the existing underground electric railway.

Croydon.—Year's Working.—The report of the manager of the Corporation tramways (Mr. T. B. Goodyer) for the year ended March 31st last, records a total income of £153,012, and a working expenditure (including a special item of £609) of £148,612, leaving a gross surplus of £4,400. In the previous year the revenue was £181,737; the expenditure, £163,715; and the balance £18,022. The surplus was insufficient to meet the capital charges, which amounted to £13,540, and the result was a net deficit of £9,140. In the previous year there was a profit of £3,254. A sum of £2,327 was spent on the permanent way during the year. The number of car-miles run decreased by 52,140 to 2,287,953, and the number of passengers carried by 2,103,036 to 22,873,404. A table included in the report shows that the ratio of working expenses to receipts has risen from 82.12 per cent. in 1913-14 to 98.40 per cent. in the past year.

Dublin.—Fare Revisions.—Following the report of the Free State Tramways Charges Advisory Committee, the Minister of Industry and Commerce has issued an Order to the Dublin United (Electric) Tramways Co. revising the statutory fares chargeable by it. The effect is that 1d. fares will be re-introduced for stages of about a mile. The Order refers only to stages on which fares were fixed by statute, but it is understood that the penny stages will also be re-established on lines to which the statutory charges do not apply, the scheme coming into operation as from August 24th.

Edinburgh.—Results of Electrification.—It is reported that the electrification of the tramways is proving very satisfactory, and an early general reduction in fares is foreshadowed.

Fleetwood.—Accident.—On August 15th, there was a collision between a tramcar and a horse and cart on one of the Fleetwood-Blackpool lines. The vehicles were damaged, but there was no personal injury.

Japan.—Formosa.—A scheme is under consideration for the connection of the east and west coasts of the island by an electric railway by means of branch lines from the Taiwan Electric Co.'s Nisui-Gaishetei line across the mountains to Kwarenko or a point further south. A sum of 50,000 yen has been allocated for the purpose of a survey.

Railway Electrification.—At present about 63 miles of the Government Railways is electrified, but a programme which has been commenced provides for the conversion of a further 450 miles. The principal line to be electrified will be that from Tokio to Kobe, with an extension to Akashi, a length of 377 miles. At present power for the electrified lines is derived from steam- and gas-engine plant, but it is proposed to erect a 120,000-kW station to utilise the power of the River Shinano. A 1,500-V d.c. overhead system is to be employed, the power being converted from a.c. by a number of sub-stations of from 4,000 to 6,000-kW capacity.

London.—Accident.—On August 16th, a tramcar belonging to the London United Tramways collided with a motor omnibus in the Chiswick High Road. The top deck of the 'bus was partially wrecked, and a number of the passengers injured. Two of the injured persons were reported to have died shortly after the accident.

London & North-Eastern Railway. — Electrification Schemes.—*Modern Transport* states that the directors of the London & North-Eastern Railway Co. have during the past week definitely decided to embark upon a scheme for the electrification of the London suburban lines of the former Great Northern Railway. Immediately after the formation of the group, a committee of the directorate was appointed to investigate the whole question of the suburban track in the London area, particularly in relation to the advisability of electrifying the existing railways, and this decision is the first result.

The committee is now engaged in an investigation as to the possibilities of the electrification of the congested suburban lines comprised in the Great Eastern section, but as this presents a much more difficult problem no decision has yet been reached. Another important proposal exercising the minds of the directors is the possibility of a linking-up, in the vicinity of London, of the lines of the former Great Northern and Great Eastern railways in order to make traffic readily interchangeable between King's Cross and Liverpool Street stations.

This announcement was qualified somewhat by an official of the railway company in an interview with a representative of the *Evening Standard*. The former said: "The report that a decision has been come to is incorrect. So extensive is the nature of the inquiry that certainly some months will be required before any verdict can be given. Our aim is to be able to pronounce on the merits of the scheme by the end of October, so as to get it in our next Bill in Parliament, but it is by no means certain that we will be able to do that. In such a huge scheme we must satisfy ourselves on every point, and the matter is being examined in all its bearings. If adopted, the plan will probably mean the electrification of the suburban line from King's Cross right up to Hatfield, including the services to High Barnet, Palmer's Green, Edgware, and the rest. It would no doubt represent an expenditure running into seven figures, though the cost has not yet been fully worked out."

United States.—New Jersey.—A serious position has resulted from the decision of the New Jersey Public Service Railway to close down entirely owing to a strike of its employés. The company operates in ten principal towns of the State, and during 1922 carried over 141,000,000 passengers.

Chicago.—The City Council has received a report from its consulting engineer containing a scheme for the thorough reorganisation and unification of the city's transportation systems. The proposals include the construction of new subways, elevated railways, and street railways, in two sections. The estimated cost of the whole scheme is 373 million dollars.

Long Island.—The company operating the Long Island Railroad has decided to extend its electrified lines for a distance of 28 miles by July, 1924. A 10-year programme, involving the expenditure of $84,000,000, has also been drawn up.

Whitby.—Proposed New Tramway.—With a view to relieving unemployment during the coming winter, the Urban District Council has approved of several schemes, one of which provides for the construction of a cliff tramway.

TELEGRAPH & TELEPHONE NOTES.

Automatic Telephony.—London's Exchanges.—According to the daily Press, automatic telephones are, as has already been announced in this column, to be installed in London. Orders are to be placed immediately for three large exchanges for the Central district. In the provinces there are already over 20 of these exchanges in operation, and between 30 and 40 additional exchanges have been authorised, and will be installed when the necessary buildings have been prepared. Speedier and more accurate service results from the replacement of manual operators by automatic machines. Present plans for London foreshadow the provision of automatic exchanges to serve over a million subscribers. The substitution will occur in stages, and will occupy, it is thought, from 10 to 15 years.

The *Financier* states that the Post Office has contracted with the Automatic Telephone Manufacturing Co., Liverpool, for the supply of 50,000 lines of Strowger director automatic telephone equipment, together with a large junction exchange, for the purpose of interconnecting the existing manual and automatic telephone systems during the period of conversion. The whole installation will form the nucleus for the conversion of the entire London telephone system to Strowger automatic operation.

Sheffield's Exchange.—The new automatic telephone exchange which is in course of erection in Bow Street will not be ready for occupation until 1926. The new exchange will be equipped from headquarters. At present there are approximately 9,000 subscribers in Sheffield, and although included in the Sheffield area, the towns of Chesterfield, Worksop, Barnsley, and Rotherham will not be converted.—*Sheffield Independent.*

China.—Peking Wireless Station.—The wireless station at Peking erected by the Japanese Missui Co. is completed and in touch with Bordeaux. It is estimated to have cost half a million sterling.—*Financial Times.*

Japan.—Underground Telegraph and Telephone Circuits.—The Tokio municipal authorities have decided to put all their telegraph and telephone circuits underground. A start will shortly be made with this work in the business section of the city.—*Reuter's Trade Service* (Tokio).

RADIO-TELEGRAPHY AND TELEPHONY.

Radio-Broadcasting. — Relay Stations.—Further experiments have been carried out from the London broadcasting station in relaying programmes from one part of the country to another, and it seems that reception in all parts of the country has been good.

Wave Length.—It has been proved by the London station that a slight increase in wave length can extend a broadcasting station's range of transmission during bright summer days, the proof being within the limits covered by the series of experiments undertaken by 2LO recently on a wave-length increased from 369 to 400 metres. There seems, however, to be considerable speculation as to the exact cause of the falling-off of signal strength during "the warm weather."

Apparently, similar results have been achieved in America, for the *Electragist* reports, with regard to the operation of the new wave-length allocations, that the Department of Commerce reports that nine radio supervisors have in all cases noted satisfaction. Practically all listeners are experiencing better reception than at this time last summer, when there were some 500 stations operating on 360 and 400 metres, whereas to-day the class B stations have about 40 exclusive national waves and the A stations have 31 waves assigned in the various radio districts. Approximately 300 of the old stations continue in class C, operating on 360 metres.

Naturally with the increased wave-lengths used by some of the stations, some receiving sets had to be altered or provided with loading coils. Practically all of the smaller and more inexpensive sets made in the past have been limited to about 400 or 450 metres and the extensions above this point have been easily made.

Trinidad.—Radio-Telephony.—Radio-telephone apparatus is to be installed by the Government of Trinidad at the Port of Spain wireless station to link up with stations already established by a British oil company in the Orinoco delta in Venezuela. The development of a system of radio-telephony throughout the West Indies is in contemplation.

CONTRACTS OPEN AND CLOSED.

(The date given in parentheses at the end of the paragraph indicates the issue of the Electrical Review *in which the "Official Notice" appeared in our advertisement pages.)*

OPEN.

Aberdeen.—September 17th. Electricity Department. Coal-handling plant. (See this issue.)

Argentina.—Buenos Aires.—September 10th-October 3rd. State Railways. Stores (including telegraph, telephone, and electrical materials) for 12 months.*

Belgium.—September 7th. Belgian Post and Telegraph authorities, La Salle Madeleine, Brussels. 43 lots of telephonic apparatus and accessories.

September 8th. Municipal authorities of Hecht (Province of Limbourg). Establishment of a l.p. electricity distribution system in the town. (Particulars 15 fr.)

(*Continued on page* 290.)

THE HARBOUR POWER STATION, BELFAST.

Inauguration of New Plant.

The supply of electricity in the City of Belfast was first commenced by the Corporation from the Chapel Lane station in January, 1895. The first portion of a second generating station in East Bridge Street was inaugurated in October, 1898; in 1905 the Corporation acquired the whole of the street tramways in the city,

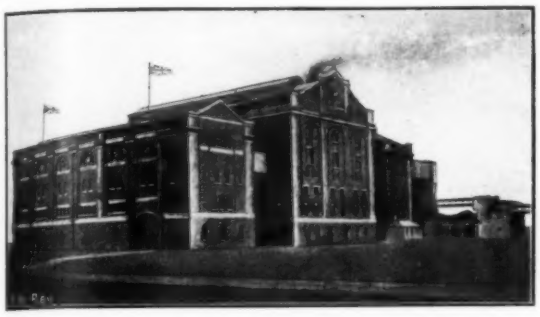


Fig. 1.—Exterior of Station.

which involved doubling the capacity of the generating station, and since then the installation has been further extended from time to time.

When, in 1911, it became evident that the East Bridge Street station was not adequate to meet future requirements, various schemes were taken into consideration; but in 1914 the outbreak of the great war and Treasury restrictions on capital expenditure compelled the Council to defer the matter until more favourable conditions should obtain. Towards the end of 1917, however, steps had to be taken, at the instance of the Director of Electrical Power Supplies, to satisfy applications for electricity from the shipyards; accordingly a site for a new station was purchased from the Belfast Harbour Commissioners, in place of one previously offered by them (which was subsequently acquired by Messrs. Harland & Wolff, Ltd., for an auxiliary shipyard), and the first pile for the foundations was driven in September, 1919, by the Lord Lieutenant, Field-Marshal Viscount French of Ypres.

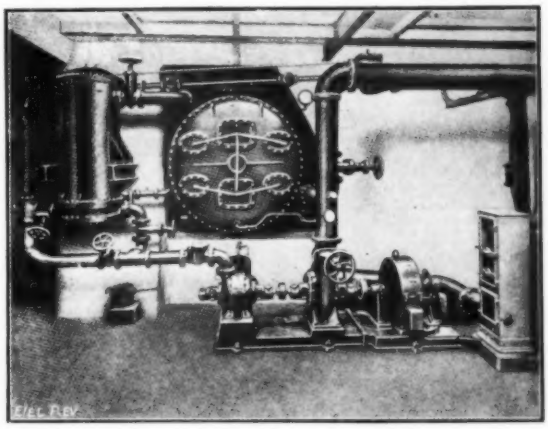


Fig. 3.—Condensing Plant, No. 1 Set.

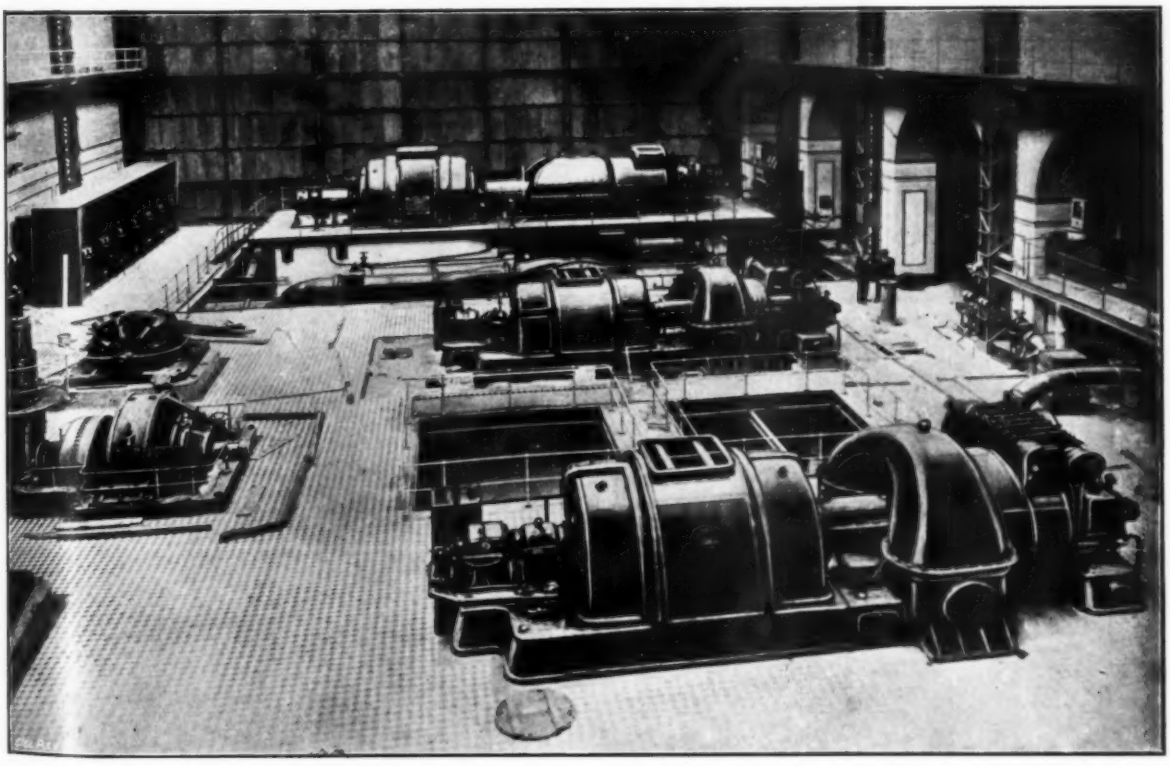


Fig. 2.—Turbine Room at the Harbour Station.

Meanwhile the demand for electricity from the shipyards became so persistent that it was decided in June, 1920, to erect the first two turbo-generators ordered for the new Harbour Power Station in a temporary station alongside the former; they commenced to furnish a

supply in November of the same year, and the temporary station has only recently been closed down. The two 6,000-kW machines it contained have been moved to their permanent positions in the Harbour Power Station, which was officially inaugurated by His Grace the Duke of Abercorn, K.P., Governor of Northern Ireland, on August 15th, in the presence of a distinguished gathering.

The station site comprises 20 acres, and ample provision has been made for future extensions; there is an abundant supply of water for condenser cooling purposes, and coal can be unloaded direct from ships into the bunkers. The present capacity of the station is 24,000 kW, but at the end of last year it was decided to add a second 12,500-kW turbo-alternator (which is now on order) which, with the boiler plant already installed, will raise the station capacity to 34,000 kW; the site is, however, capable of further development to the extent of at least 150,000 kW.

The buildings, fig. 1, are of brick and reinforced concrete, the city surveyor, Mr. H. A. Cutler, M.Inst. C.E., having been responsible for their design and construction. No fewer than 4,000 foundation piles had to be driven, the approximate weight of the buildings and plant they have to support being 40,000 tons.

The turbine room, fig. 2, at present contains two 6,000-kW and one 12,500-kW machines, the gauge steam pressure being 225 lb. per sq. in., and the superheat 253 deg. F. The smaller sets, fig. 2, were supplied by the British Thomson-Houston Co., Ltd., and their condensing plant, fig. 3, by Messrs. Worthington, Simpson, Ltd., each condenser having a tube surface area of 11,000 sq. ft. and needing 9,000 gallons of cooling water per minute. The air and condensate pumps are coupled together and driven by a 90-b.h.p., 900-r.p.m., 440-V, d.c. motor.

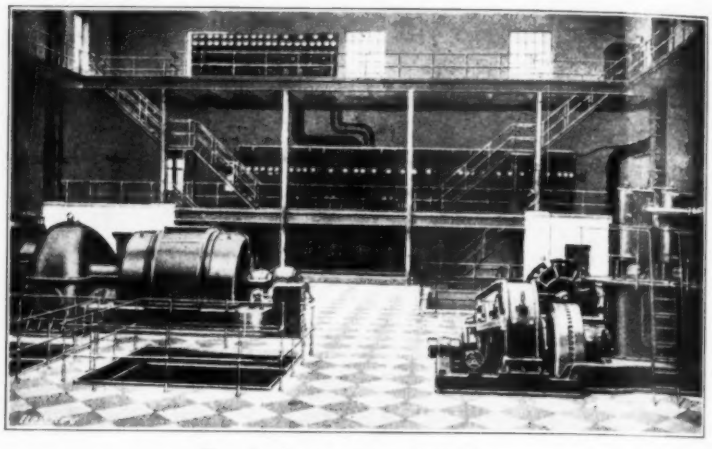


Fig. 4.—Switchboard Galleries.

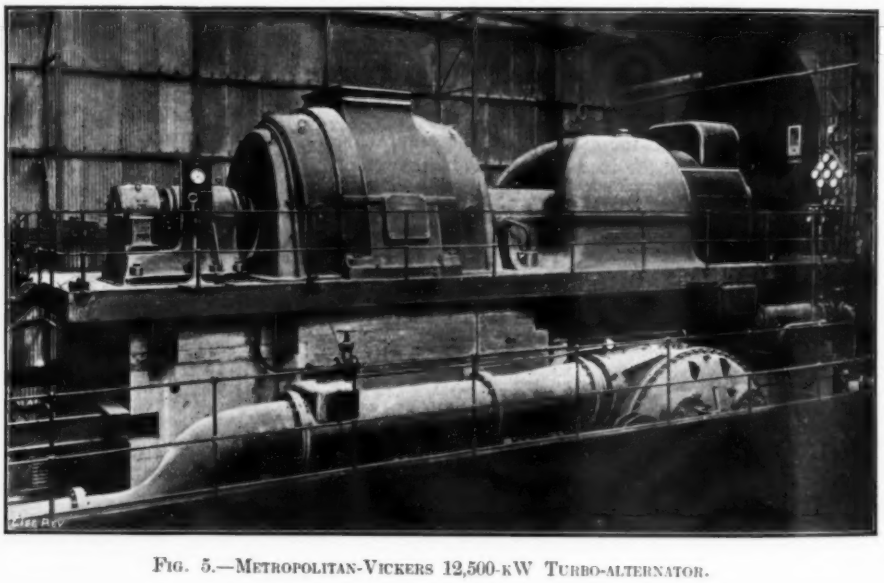


Fig. 5.—Metropolitan-Vickers 12,500-kW Turbo-alternator.

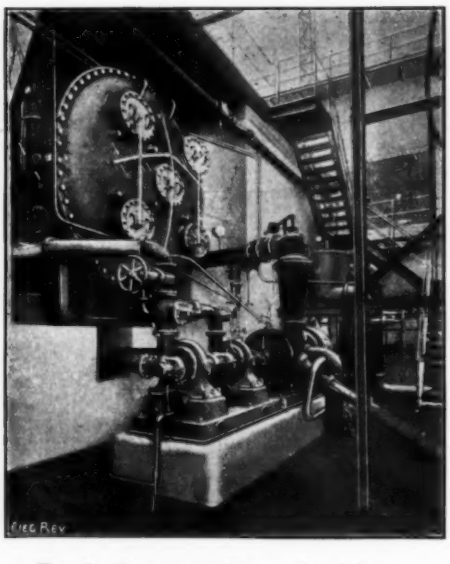


Fig. 6.—Condensing Plant, No. 3 Set.

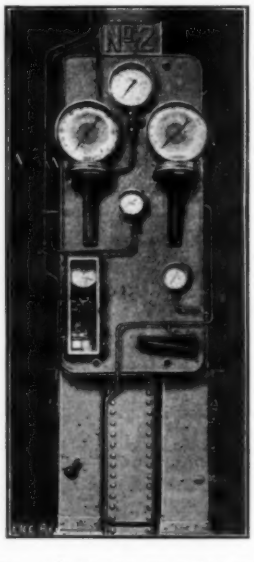


Fig. 7.—Instrument Board.

The large set, fig. 5, together with its condensing plant, fig. 6, was manufactured by the Metropolitan-Vickers Electrical Co., Ltd. The condenser has a tube surface area of 20,509 sq. ft., and requires 16,000 gallons of cooling water per minute; the air and condensate pumps are also coupled together in this case, and driven at 1,150 r.p.m. by a 162-b.h.p., 440-V, d.c. motor. The guaranteed vacuum in all cases is 29 in. of mercury.

The two smaller alternators each have a maximum continuous output of 7,500 kVA at 3,000 r.p.m., while that of the large set is 15,625 kVA at 1,500 r.p.m., the periodicity of the system being 50 cycles per second. In all cases the generated voltage is 6,600, and the rise of pressure when full load at 0.8 power factor (lagging) is switched off, the speed and excitation being constant, is 40 per cent. The field current at full load and

0.8 p.f. of the small machines is 200 A, and that of the large one 290 A, while the quantity of cooling air required by each of the former is 26,000 cu. ft. per minute, and by the latter 40,000 cu. ft., the large machine having an enclosed air system.

In addition to the main turbo-generators, the turbine room houses two 500-kW rotary converters, supplied by the Metropolitan-Vickers Electrical Co., Ltd., to furnish the auxiliary power needed in the station; a steam engine-driven d.c. 500-kW generator is also provided as a stand-by in the event of the failure of the converters. A B.T.H. booster balancer is provided in conjunction with a 440-volt battery, by the Tudor Accumulator Co., Ltd.; the latter is in two sections, each of which has 122 cells, and its capacity is such as will suffice to start the auxiliary plant of one of the main turbo-generators in the case of a total failure of the supply. Normally the battery will be used to energise all the trip circuits and, in addition, the whole of the station lighting can be derived from it. The station transformers were made by the English Electric Co., Ltd., and the low-pressure a.c. and d.c. auxiliary switchboard, as well as the main control board, were furnished by the Metropolitan-Vickers Electrical Co., Ltd. The former switchboard is located on the first gallery at the permanent end of the turbine room, while the latter is situated on the second gallery, as can be seen in fig. 4. A 50-ton crane, by Messrs. Thos. Broadbent & Sons, Ltd., spans the turbine house.

Fig. 8.—Coal Conveyors and Economisers.

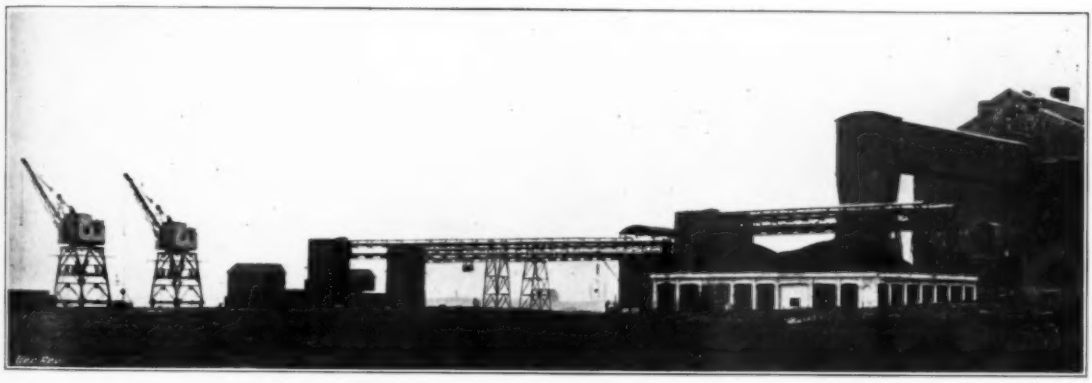


Fig. 9.—Outdoor Coal-handling Plant.

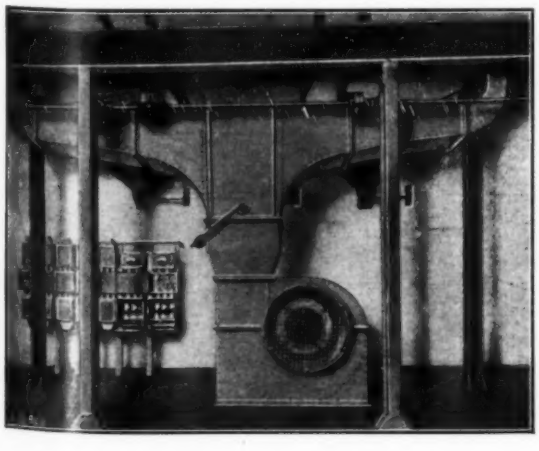


Fig. 10.—Forced-draught Fans.

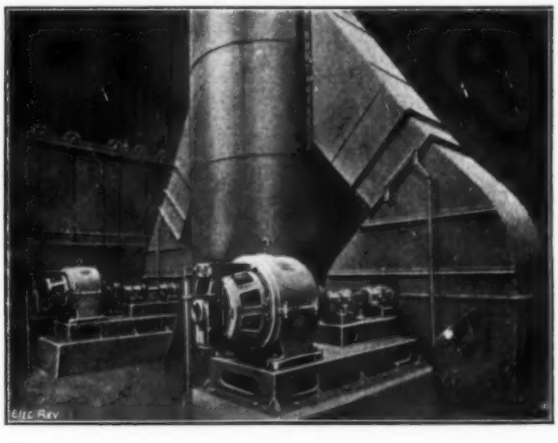


Fig. 11.—Induced-draught Fans.

The fuel-handling plant was supplied by the Fraser and Chalmers Engineering Works, Ltd. Coal can be unloaded from ships direct on to the station wharf,

which is provided with two grab cranes made by Sir W. G. Armstrong, Whitworth & Co., Ltd. The grabs,

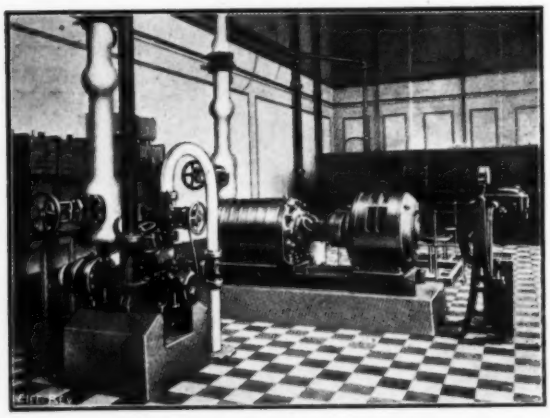


Fig. 12.—Feed Pumps.

each of which has a capacity of 60 cu. ft. of coal, discharge the fuel into hoppers that feed crushers and conveyors, each having a capacity of 40 tons per hour. Two

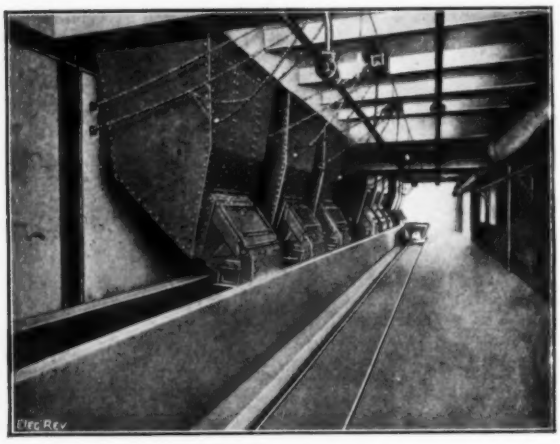


Fig. 13.—Ash-handling Plant.

conveyors are at present installed, fig. 9, but provision has been made for the addition of a third. The crushed coal is conveyed to weighing machines, whence it is picked up by a second line of conveyors of the same capacity and transported to a concrete storage hopper, as shown in fig. 9, which is capable of accommodating about 2,000 tons. From the storage hopper the coal is carried

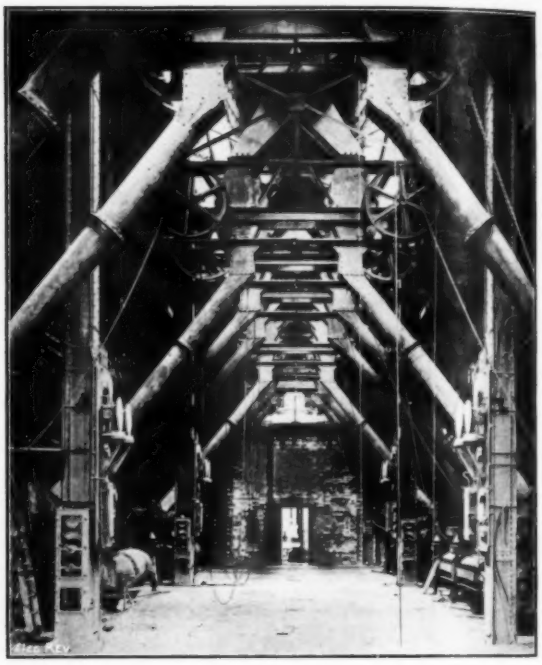


Fig. 15.—Boiler House.

by two conveyors, fig. 8, to the four boiler-house bunkers. The latter are of parabolic design, each holding 120 tons, and pass the coal through weighing apparatus to chutes which feed the grate hoppers. There is ample room on the station site for the storage of coal, and belt-conveyor equipment for handling stored fuel is now on order.

The boiler-house ground floor is divided longitudinally into three sections, the ash-handling plant being located in the wings and the forced-draught plant and stoker-driving motors in the main aisle. The first floor is the

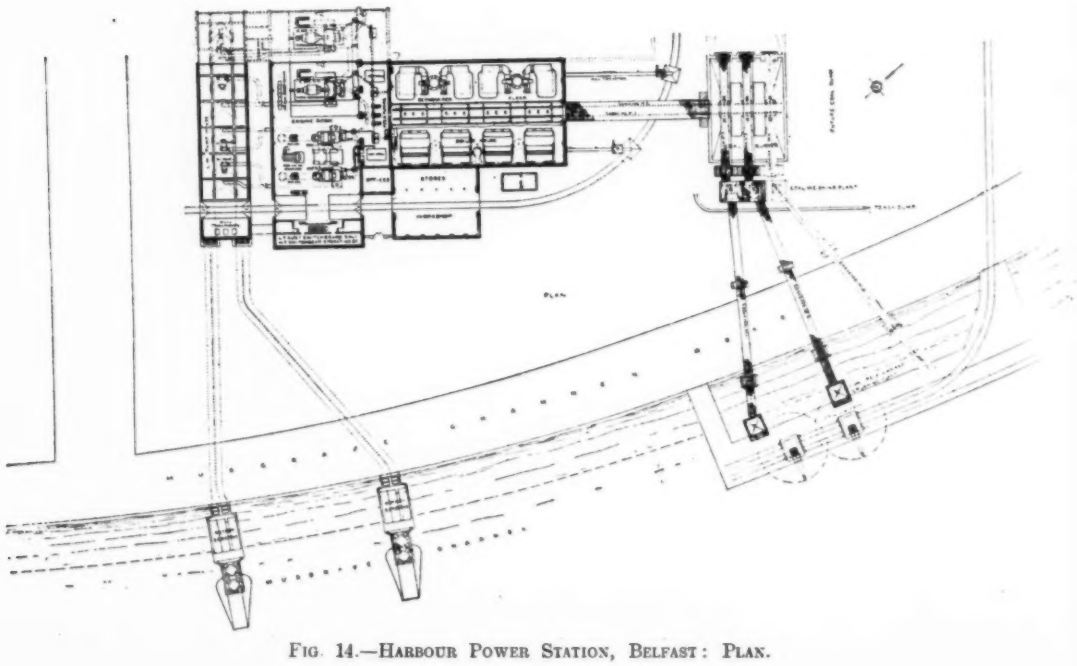


Fig. 14.—Harbour Power Station, Belfast: Plan.

firing level, the economisers and induced-draught plant being situated on the floors above the boilers in the wings of the building, and from a higher level in the middle aisle are slung the coal bunkers.

The boiler room, fig. 15, contains eight marine-type Stirling boilers, arranged in two rows of four each; each boiler "unit" has three mechanical stokers, a superheater, an economiser, and forced- and induced-draught fans, one chimney being provided for each pair of boilers. The normal output of each boiler is 55,000 lb. of steam per hour at a gauge pressure of 235 lb. per sq. in., and a total temperature of 650 deg. F. Each boiler has a heating surface of 8,166 sq. ft., and a grate area of 264 sq. ft., the heating surface of its economiser being 5,708 sq. ft. Each forced-draught fan, fig. 10, has a capacity of 32,000 cu. ft. of air per minute, and is driven by a 16-h.p. motor, while the capacity of each induced-draught fan, fig. 11, is 60,000 cu. ft. of air per minute, and each is driven by a 38-h.p. motor. The arrangements made for ensuring efficient steam generation include the provision of an instrument board, fig. 7, for each boiler "unit" and means of regulating both types of air fans.

The boiler feed-water pumps, fig. 12, together with the hot wells, are housed in an annexe between the boiler house and engine room. Two of the pumps are electrically-driven, each having a capacity of 20,000 gallons of water per hour, while the third has the same capacity, but is steam driven; the former were supplied by Messrs. Holden & Brooke, Ltd., and the latter by Messrs. G. and J. Weir, Ltd.

A vacuum plant has been installed by the British Vacuum Cleaner Co., Ltd., for extracting the flue dust from the boilers, economisers, and chimney bases; the fine dust is conveyed through pipes to an outside receiver, whence it is removed by means of wagons.

The ash-handling plant was supplied by the Underfeed Stoker Co., Ltd. The ash hoppers under the boilers discharge their contents direct into a reinforced-concrete trough, fig. 13, containing water at such a level that the hopper mouths are all sealed. A scraper conveyor in the trough collects the ashes into a bunker on the railway siding, from which they are discharged into trucks.

The supply of water for condensing purposes is drawn from the Musgrave Channel, as indicated in fig. 14, and passes through reinforced-concrete ducts to the circulating pump house. Provision has been made for the installation of screens at the intakes to remove suspended matter from the water, if such a course should be found necessary in the future; meanwhile, experience at the above-mentioned temporary station does not indicate that they will be needed.

On the south-west side of the turbine house is a building, the basement and first story of which house the condenser water pumps and gear; the waterways from the Musgrave Channel run along each side of the basement, the centre portion being watertight and forming the pump chamber. Sluice gates are so arranged that the flow of water in the ducts can be reversed, *i.e.*, the inlet can be made the outlet and *vice versa*, according to the flow of the tide. The circulating pumps were supplied by Messrs. W. H. Allen, Sons & Co., Ltd., and a 5-ton Broadbent crane spans the pump house.

The first floor of the same building houses the reactance equipment, which is connected between the busbar sections, and on the top floor is the main 6,600-volt switchgear for controlling all the generators and feeders; it comprises three alternator switches, feeder switches, and two sectionalising switches. The whole of the e.h.p. main and auxiliary switchgear in the station is of the Metropolitan-Vickers type.

A high-pressure transmission system is now being laid throughout the city for the purpose of feeding substations in each load area which will in turn supply the existing d.c. network. Large power consumers will be supplied direct from the h.p. system, the pressure being reduced to 400 volts by means of transformers on consumers' premises. All the main feeders are protected on the Merz-Hunter system.

In conclusion, it should be recorded that Messrs. Preece, Cardew & Rider acted as consultants in connection with the building of the new station, and for assistance in the preparation of this article we are indebted to Mr. Johnstone Wright, M.I.E.E., chief electrical engineer and general manager of the undertaking, which in the year 1922-23 experienced a maximum demand of about 17,500 kW and generated over 38 million kWh.

The new power station was formally opened on the 15th inst., when the Duke of Abercorn set the 12,500-kW turbo-alternator in operation in the presence of a large and fashionable assembly. Subsequently the Lord Mayor of Belfast, Alderman W. G. Turner, and the Lady Mayoress entertained the company to luncheon in the City Hall. Amongst the guests were the chairman of the Electricity Commissioners (Mr. Cecil Litchfield), the chairman of the Metropolitan-Vickers Electrical Co., Ltd. (Major-General Sir Philip Nash, K.C.M.G., C.B.), the chairman of the Electricity Committee (Alderman Oswald Jamison), the city electrical engineer (Mr. Johnstone Wright), and one of the consulting engineers (Mr. J. H. Rider).

After the toast of "The King," the Lord Mayor proposed the toast "His Grace the Governor, and prosperity to Northern Ireland." In replying, the Duke of Abercorn said the opening of the new station was an illustration of the progress of their great city, and he had been deeply impressed by the completeness and up-to-date arrangement of the machinery and buildings. To all connected with the scheme the greatest credit was due, and he hoped that the supply of cheap electricity would be conducive to the prosperity of the trade of the city.

Sir James Craig, Premier of Northern Ireland, proposed "Success to the Belfast Corporation Electricity Undertaking." He said that not only Ireland, but Great Britain, fell far behind some other countries in electrical development. Belfast had, however, an extraordinary way of overtaking things, and he believed that this power supply would go a long way towards promoting the prosperity which Belfast deserved.

Alderman Oswald Jamison, chairman of the Electricity Committee, said that the prosperity of the undertaking was already assured. The new station was built on an ideal site, convenient to an abundant supply of clean water, with accommodation which, when extended, would meet the requirements for the next 25 years. With regard to coal, he hoped the time was not far distant when they would be getting all they required from the rich coalfields at Coalisland. Their coal account for the last twelve months amounted to £72,000, and when it was possible to do so, they would spend that money at home. Thus in coal and water, the two great essentials for the successful working of an electric power station, they were in an exceedingly fortunate position. From the new station they could guarantee a cheap, efficient, and abundant supply of electrical energy to manufacturers. Their average coal consumption for the year ending March, 1923, was 3.44 lb. per kWh generated, whilst the estimated production for the next 12 months was 41,000,000 kWh, and it was quite safe to assume that they would save 1 lb. of coal per kWh, representing an annual decrease in coal costs of £22,000. The other costs would be proportionately reduced. They had anticipated these reductions, and had reduced their power charges from July 1st by from 30 per cent. to 50 per cent. Later on they would make further reductions. The Electricity Committee already had planned the extension of the new station, and the Metropolitan-Vickers Electrical Co., Ltd., was building a 12,500-kW machine, which would be erected in time for the winter load of 1924.

Major-General Sir Philip Nash, representing the contractors, said that he had pleasure in handing to Alderman Jamison, as a present for Mrs. Jamison, a diamond ring. The electricity industry was very young, but in every stage of its development there had been born into the world a new industry.

CONTRACTS—OPEN.

(*Continued from page* 284).

Australia.—SYDNEY.—September 24th. Municipal Council. Consumers' meters and sub-station apparatus. December 3rd. 33,000/5,000-V switchgear and apparatus for sub-stations. November 19th. Step-down transformers.*

December 3rd. H.p. switchgear and apparatus.*

October 31st. N.S.W. Government Railways and Tramways Department. Three steam turbine-driven centrifugal boiler feed pumps air washer and humidifier. October 24th. Rotary-converter units.*

BRISBANE.—September 19th. Postmaster-General's Department. Telephone apparatus and parts. October 3rd. Switchboard apparatus and parts. October 10th. Protective apparatus.*

PERTH (W.A.).—October 10th. Postmaster-General's Department. Battery plates, wood separators &c. October 31st. Telephone and telegraph apparatus, testing instruments, &c.*

Belfast.—September 17th. Electricity Department. 3-phase e.h.p. a.c. switchgear. (See this issue.)

Birmingham.—August 31st. H.M. Office of Works. Lancashire boiler for the P.O. telegraph factory at Birmingham. H.M. Office of Works, King Charles Street, S.W.

Bradford.—September 6th. Electricity Department. One surface condensing plant, with auxiliaries. (August 10th.)

Canada.—TORONTO.—October 9th. Municipal Council. A.c. generator.*

Chesterfield.—September 12th. Electricity Department. Electrically-driven induced-draught plant, with starting and regulating gear, dampers, &c. (See this issue.)

Croydon. — September 5th. Electricity Department. 5,000 tons of coal of any of the following grades: Double screened nuts, ¾ in. to 1¼ in.; peas or beans, ⅜ in. to ¾ in.; best quality 1¼ in. to 1¾ in. rough slack. (See this issue.)

Edinburgh.—September 3rd. Electricity Supply Department. Extension of five d.c. feeder panels at Leith sub-station. (August 17th.)

Esthonia.—September 1st. Reval Tramways Administration. Tramway standards.*

Farnworth.—September 17th. Electricity Department. One 50-kW rotary converter with transformer, switchgear, instruments, cables, &c. (August 17th.)

Fleetwood. — August 27th. Electricity Department. 1,050 yd. cable. (August 10th.)

Halifax.—September 7th. Tramways and Electricity Committee. One 10,000-kW turbo-alternator, with condenser. (August 17th.)

Hornsey.—September 10th. Electricity Department. L.p. switchgear. (See this issue.)

Irish Free State.—DUBLIN.—August 27th. Streets Committee. Two 3½-ton electric lorries for house refuse. Supt. of Cleansing, 15, Wood Quay, Dublin.

RATHMINES, DUBLIN.—August 29th. Rathmines and Rathgar Urban Council. 50-125 electricity prepayment meters. Mr. D. Mason, Clerk to the Council, Town Hall, Rathmines, Dublin.

London.—BERMONDSEY, S.E.—September 6th. Board of Guardians. Six months' supply of electric lamps. Mr. H. H. Reeve, clerk to the Guardians, 283, Tooley Street, S.E.

BETHNAL GREEN, E.—September 4th. Board of Guardians. Telephone instruments in the Administrative Offices, Bishops Road, Bethnal Green. (See this issue.)

EDMONTON, N.—September 10th. Board of Guardians. Six months' supply of electric lamps. Mr. E. Ridley, clerk to the Guardians, 77, Bridport Road, Edmonton, N. 18.

Manchester.—September 15th. Waterworks Committee. One set electrically-driven h.p. centrifugal pumps. (August 10th.)

Merthyr Tydfil.—September 18th. Board of Guardians. Electrical fittings for six months. Mr. F. T. James, Clerk, High Street.

Newcastle-under-Lyme.—August 27th. Electricity Department. 3,000 yd. 3-core e.h.p. armoured cable. (August 10th.)

New Zealand. — WELLINGTON.—October 22nd. Public Works Department. One 400-kVA, 3-phase transformer, complete.*

Norwich. — September 11th. Electricity Department. Generating plant in connection with Thorpe power station. (August 10th.)

Plymouth.—September 19th. Electricity Department. One 6,000-kW turbo-alternator, condenser, &c., and 1,000-kW converter. (August 17th.)

Pontypridd. — August 27th. Electricity Department. 2,700 yd. 3-core, l.p. cable, 2,000 yd. l.p. electric lighting overhead lines. (August 10th.)

Singapore.—September 7th. Municipal Commissioners. 5,000-kW turbo-alternators and condensing plant; water-tube boilers draught plant, and steel chimney. (August 10th.)

Sleaford.—September 5th. Electricity Department. Pair of feeder cables. (See this issue.)

South Africa.—JOHANNESBURG.—September 24th. South African Railways Tender Board. Incandescent lamps.*

September 18th. Municipal Council. One 2,000-kW converter panel, transformers, overhead tramway equipment, and 500 rolled steel tramcar tires. September 24th. Rotary converter.*

UITENHAGE, CAPE TOWN.—September 13th. Municipal Council. Electrical plant.*

Stoke-on-Trent.—September 12th. Electricity Department. Two cooling towers (200,000 gallons each), with cooling ponds and accessories. (See this issue.)

Uruguay.—MONTEVIDEO.—October 15th. Comision del Palacio Legislative. 286 electric light chandeliers and brackets.*

October 15th. State Electricity Works. L.p. armoured cable, telephone cable, and accessories.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

CLOSED.

Australia.—MELBOURNE.—City Council. Accepted:—

A.c. switchgear (£5,149).—Australian General Electric Co., Ltd.
D.c. switchgear (£3,110).—Ferguson, Pailin, Ltd.
2,500-kW rotary-converter (£7,619).—Metropolitan-Vickers Electrical Co., Ltd.
H.d. copper cables (£3,251).—British Insulated & Helsby Cables, Ltd.
Switchgear for sub-stations (£1,781).—English Electric Co. of Australia, Ltd.

SYDNEY.—City Council. Accepted:—

Transformers (£1,528).—Johnson & Phillips, Ltd.

VICTORIAN ELECTRICITY COMMISSION. Accepted:—

Transformers (£1,192).—Homewood & O'Neill.
Motors, starters, and switches (£614).—Electric Construction Co., Ltd. (£1,447).—Siemens Bros. & Co., Ltd. (£452).—Australian General Electric Co., Ltd.
6,600-V cable and accessories (£3,831).—Western Electric Co., Ltd.

NEWCASTLE (N.S.W.).—City Council. Accepted:—

500 meters (£812).—Electricity Meter Manufacturing Co.
1,500 type H Sangamo meters (£2,998).)—Edison Swan Electric Co., Ltd.—*Tenders.*

Basford.—Board of Guardians. Accepted:—

Installation of electric lighting at the Institution (£1,805).—J. & S. Farr, Ltd.

Derby.—London, Midland and Scottish Railway.

One 1,500-kW steam turbine, direct coupled to Lancashire Dynamo Motor Co.'s electric generator, with surface condensing plant, for the company's workshop, electric power station, Derby.—Belliss and Morcom, Ltd.—*Railway Gazette.*

Government Contracts.—The following Government contracts were placed during July, 1923:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.

Cells for submarine batteries.—D.P. Battery Co., Ltd.
Hot cupboards.—Electric Fires, Ltd.
Feeder equipment.—British Thomson-Houston Co., Ltd.
Induction regulators.—British Thomson-Houston Co., Ltd.
Converting plant.—General Electric Co., Ltd.
Plate groups for submarine batteries.—Chloride Electrical Storage Co., Ltd.

WAR OFFICE.

Parts for electric signalling lamps.—C. A. Vandervell & Co., Ltd.
Electric locomotive.—English Electric Co., Ltd.
Meters (various).—Chamberlain & Hookham, Ltd.
Electric lighting installation Canterbury Barracks.—A. V. Gilkins and Co., Ltd.

AIR MINISTRY.

Delco ignition system spares.—Delco Remy Co., Ltd.
Wireless apparatus.—General Electric Co., Ltd.
Hand-driven generators.—Evershed & Vignoles, Ltd.

POST OFFICE.

Telegraph apparatus.—Western Electric Co., Ltd.
Telephone apparatus.—British L. M. Ericsson Manufacturing Co., Ltd.; General Electric Co., Ltd. (Peel Conner Telephone Works); International Electric Co., Ltd.; Siemens Bros. & Co., Ltd.; Western Electric Co., Ltd.
Testing, protective apparatus.—Phœnix Telephone and Electric Works, Ltd.
Leclanché battery boxes.—Siemens Bros. & Co., Ltd.
Submarine cable.—Telegraph Construction and Maintenance Co., Ltd.
Telegraph and telephone cable.—British Insulated & Helsby Cables, Ltd.; Enfield Ediswan Cable Works, Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. & Co., Ltd.; Union Cable Co., Ltd.; Western Electric Co., Ltd.
Dry cells.—Ever-Ready Co. (Great Britain), Ltd.; Fuller's United Electric Works, Ltd.
Leclanché porous cells.—General Electric Co., Ltd.; Siemens Bros. and Co., Ltd.
Loading coils.—Western Electric Co., Ltd.
Telephone cords.—Western Electric Co., Ltd.
Ducts.—Hepworth Iron Co., Ltd.; Mountford, Phillips & Co. (1920), Ltd.
Insulators.—Bullers, Ltd.; T. De La Rue & Co., Ltd.
Glass Leclanché jars.—Bagley & Co., Ltd.
Stoneware Leclanché jars.—J. Bourne & Son, Ltd.
Telephone lamps.—Edison Swan Electric Co., Ltd.; General Electric Co., Ltd.
Tinfoiled condenser paper.—Brittains, Ltd.
Insulator rings.—Avon India Rubber Co., Ltd.
Solder.—British Insulated & Helsby Cables, Ltd.
Stripping, reserving, and armouring submarine cable.—Telegraph Construction and Maintenance Co., Ltd.

H.d. copper wire.—T. Bolton & Sons, Ltd.; British Insulated & Helsby Cables, Ltd.; R. Johnson & Nephew, Ltd.; Johnson, Clapham and Morris, Ltd.; Shropshire Iron Co., Ltd.; F. Smith & Co., incorporated with the London Electric Wire Co. & Smiths, Ltd.
Leclanché rod zincs.—Siemens Bros. & Co., Ltd.
Supports, drawing-in, and jointing cable.—Bristol-Gloucester; Hop-Gerrard: Western Electric Co., Ltd. Leeds-Hull (Leeds, Boothferry South): Siemens Bros. & Co., Ltd. Worcester-Gloucester; Rochdale-Halifax: British Insulated & Helsby Cables, Ltd. Edinburgh-Kirkcaldy-Dundee: Johnson & Phillips, Ltd. Slough-Maidenhead: Callender's Cable and Construction Co., Ltd. Chatham-Maidstone, Luton-Bedford, Blackpool-Fleetwood: W. T. Henley's Telegraph Works Co., Ltd.
Telephone exchange equipment.—*Daily News* office: Heap & Son, Ltd., Rochdale; Debenhams, Ltd.; Relay Automatic Telephone Co., Ltd. Bristol: Western Electric Co., Ltd. (sub-contractors for batteries: Tudor Accumulator Co., Ltd.). Albert Docks, E.: British L. M. Ericsson Manufacturing Co., Ltd. (sub-contractors for batteries: D.P. Battery Co., Ltd.); for generator and ringing sets: Crompton and Co., Ltd.

CROWN AGENTS FOR THE COLONIES.

Busbar and feeder-board extensions.—Ferguson, Pailin, Ltd.
Cable.—Callender's Cable & Construction Co., Ltd.
Generating set.—Belliss & Morcom, Ltd.
Watt-hour meters.—Ferranti, Ltd.
Telegraph line material.—Bullers, Ltd.
Telegraph poles.—Siemens Bros. & Co., Ltd.
Bare copper aerial wire.—F. Smith & Co., Ltd.

H.M. OFFICE OF WORKS.

Electric lighting (Hebburn housing scheme).—Sleigh & Wood.

Leeds.—The Corporation Electricity Committee recently invited tenders for a 10,000-kW turbo-alternator and condensing plant, and on considering the offers received it was found, says the *Leeds Mercury*, that the quotations of Continental firms were considerably lower than those of any British firm. The Committee has referred the tenders to a sub-committee for full consideration.

Manchester.—Electricity Committee. Accepted:—
Cables for 12 months.—British Insulated & Helsby Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Enfield Ediswan Cable Works, Ltd.; Pirelli-General Cable Works, Ltd.; Siemens Bros. and Co., Ltd.; Western Electric Co., Ltd.; Johnson & Phillips, Ltd.; Macintosh Cable Co., Ltd.
L.p. d.c. switchgear (Dickinson Street sub-station).—Bertram Thomas, Ltd.
Thrust borer.—Hydraulic Engineering Co., Ltd.
6,600-V cubicle-type switchgear for sub-stations.—General Electric Co., Ltd.
4-ton runway for boiler-house (Barton power station).—Herbert Morris, Ltd.
Electric capstan and bollards.—Sir W. G. Armstrong, Whitworth & Co., Ltd.
Pressure-testing equipment.—Ferranti, Ltd.

Tramways Committee. Accepted:—
Two light-weight traction motors.—English Electric Co., Ltd.
H.d. copper trolley wire.—F. Smith & Co., Ltd.; R. Johnson & Nephew, Ltd.
Silicium bronze trolley wire.—Collier Bros.
Double sand-drying apparatus.—Vickers, Ltd.
Vacuum cleaner for tramcar cleaning.—Dod Bros.
Special track work.—United States Steel Products Co.
Tramcar resistances.—Electro-Mechanical Brake Co., Ltd.

Education Committee. Accepted:—
Electric lighting installation at schools.—Ross Place: Power and Lighting Supplies, Ltd.; Varna Street: Hall & Stinson, Ltd.; Wheler Street: Ward & Booth, Ltd.; Elysian Street: R. S. Miller; Collyhurst Municipal and Cheetham Temporary: Maitland & Co.; Alfred Street: Power and Lighting Supplies, Ltd.

Rivers Committee. Accepted:—
Two pumps for the Davyhulme works.—Metropolitan-Vickers Electrical Co., Ltd.
Electric lighting installation at Davyhulme works.—Hall & Stinson, Ltd.

Housing Committee. Accepted:—
Electric lighting installation of houses on the following estates:—Blackley, Clayton, and Catterick Hall estates.—W. Spreadborough. Newton estate.—E. L. Bellhouse & Co. Anson estate.—J. V. Pyatt.

Margate.—Education Committee.
Electric lighting installation, Boys' Central School (£280).—Margate and District Electrical Co., Ltd.

Quarry Bank.
Installing electric lighting at the Congregational Mission Church at Quarry Bank.—Mr. J. E. Shaw.

South Africa.—JOHANNESBURG.—Municipal Council. Accepted:—
A.c. meters.—(£643), British Agencies, Ltd.; (£1,631), Hubert Davies and Co., Ltd.; (£247), Rice & Diethelm, Ltd.
A.c. meters and transformers (£546).—Metropolitan-Vickers Electrical Co., Ltd.
Trolley wire (£636); twin and other cable (£8,643).—Telegraph Manufacturing Co., Ltd.
Transformers.—(£378), Blanc & Co., Ltd.; (£1,883), Rice & Diethelm, Ltd.—*S.A. Mining and Engineering Journal.*

FORTHCOMING EVENT.

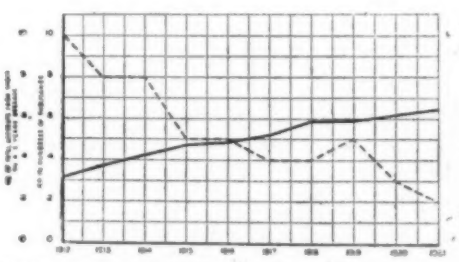
Shipping, Engineering and Machinery Exhibition.—At Olympia, W. August 31st to September 22nd.

NOTES.

The Electrification of the S.E. & C. Rly.—CORRECTION.—We regret that in the article bearing the above heading in our last issue it was stated that a contract for the supply of power to the railway had been secured by the County of London Co., whereas it is the London Electric Supply Corporation which has been awarded this contract. A notification of the latter company's application for a Special Order for this purpose appeared in our issue of July 27th (p. 144).

Electric Cranes at Docks.—Four electric wharf cranes of a new type, designed and manufactured by Messrs. Babcock & Wilcox, Ltd., are being provided by the Mersey Docks and Harbour Board at its new dock sheds which have recently been completed at the West Float, Birkenhead. These cranes have a lifting power of about five tons, and are fitted with carefully-devised electric machinery for the speedy lifting, slewing and depositing of the load. These cranes can travel on their own bogies up and down the wharf as required and are able to pass over loaded railway wagons on the lines below. The distance between crane rails is 15 ft. The main lifting motor develops about 50 h.p., and electricity is to be taken from the Wallasey Corporation mains.

Electrical Fatalities in Mines.—In the course of his recent presidential address to the Association of Mining Electrical Engineers, Mr. W. T. Anderson referred to the decline in deaths from electric shock in mines during recent years, and exhibited the accompanying chart, which we reproduce from the *Iron and Coal Trades Review*, showing the rapidly falling death rate from shock compared with the increasing horse-



COMPARISON BETWEEN INCREASE OF E.H.P. (LINE) AND FATAL ELECTRIC SHOCKS (POTTED LINE) BELOW GROUND AT COLLIERIES.

power of motors employed underground in mining work. He pointed out that the risk of accident did not increase proportionately with the horse power; obviously the installation of, say, 50 small motors introduced greater possibility of shock than did the same power concentrated in one large winder motor. However, making allowance for the effects of such factors, the falling rate of accidents indicated improvement, not only in the structural design of electrical apparatus, but also in the capabilities of those in charge of it.

Hafnius.—The Nobel Prize winner, Prof. Bohr, is still experimenting with the new element, hafnium. It is expected that it will be possible to use hafnium in the manufacture of audion lamps used for radio-telegraphy. A Dutch firm is now investigating the possibilities of its use in this manner. In Norway and Greenland minerals containing hafnium have been discovered. It is hoped that hafnium in great quantities may be found, and an expedition will probably be sent to Greenland to investigate the geological conditions.—*The Times.*

Magnetic Interference.—Electric railways at Greenwich are disturbing the Lords of the Admiralty. The electricity is said to be affecting the ships' compasses adjusted in the Admiralty buildings there to such an extent that the magnetic "needles" cannot distinguish between the North Star and a live rail pointing south-east. To stabilise the true pole the Admiralty proposes to erect adjustment buildings on Holmbury Hill, Surrey, near the village of Shere. Eight acres of ground are to be utilised, and the Admiralty promises that should the buildings be found unsuitable the site will be restored. Nevertheless there has been some opposition locally to the scheme.—*Daily Mail.*

Educational.—UNIVERSITY OF LONDON, UNIVERSITY COLLEGE, FACULTY OF ENGINEERING.—The 1923-24 Session begins on Monday, October 1st. A Goldsmid entrance scholarship, of the value of £120, tenable in the Faculty of Engineering, will be competed for in September next. Application must be made not later than September 8th. Particulars may be obtained on application to the Secretary, University College, Gower Street, W.C.1.

THE POLYTECHNIC, Regent Street, W.—Electrical Engineering Department, Session 1923-4.—The day courses will commence on September 18th and evening courses on September 24th. Early application for admission to the day course is advised; enrolments for evening courses commence September 12th. Particulars from the Director of Education, The Polytechnic, 309, Regent Street, W. (See our advertisement pages to-day).

Empire Cancer Campaign.—The British Red Cross Society, which is organising the appeal for the British Empire Cancer Campaign (to raise £1,000,000 for Cancer Research) is appealing for voluntary workers who will assist in the collection of funds. From the headquarters of the Society, 19, Berkeley Street, W.1, full particulars may be obtained. Local organisers willing to assist the campaign may also obtain literature, &c., through the local branch of the British Red Cross Society.

Radio Note.—The Postmaster-General having agreed to consider representations from the Wireless Retailers' Association on the subject of radio broadcasting licences and royalties, a resolution embodying the views of several hundred radio apparatus retailers, which has been passed by the Association's committee and forwarded to him is as follows:—

(1) That subject to any special regulations for experimenters which may be deemed necessary in the national interest, there should be only one kind of licence for all owners of receiving sets, whether home-constructed or not.

(2) That the policy of raising revenue for broadcasting by adding a royalty to the purchase price of apparatus, being unfair in its incidence and prejudicial to the sale of instruments, should be discontinued. All direct contribution made by the public for this service should be paid as a licence fee or another form of separate annual payment.

(3) That the proportion of the licence fee retained by the Government, being equal to 100 per cent. of the sum handed over to the British Broadcasting Co., is unreasonable and harmful to the industry. If levied as an entertainment duty, it should be reduced to the same percentage as that charged in respect of other forms of entertainment. The committee is, however, of the opinion that there is no more justification for the direct taxation of listeners than of users of gramophone records or music rolls, especially as this is a new industry.

(4) That, having regard to the very great increase in the number of licence holders which may be expected as soon as the licence question is settled, and the probability that by means of relay stations it will be found practicable to broadcast from one centre for the whole country, the committee is of the opinion that a 10s. licence fee is adequate to cover the expenses of broadcasting and cost of collection, but submits that the fee should be subject to reconsideration in the light of subsequently published figures.

The Electricity Supply Association of Ireland.—The first annual meeting of the Electricity Supply Association of Ireland was held in the Dublin Mansion House on August 14th, Mr. W. Hewat presiding. The chairman said the position of the electrical power industry in the matter of supply was very much behind in Ireland as compared with other countries, mainly on account of the small extent to which industry in general had been developed. This fact, however, made the work of the Association all the more important, inasmuch as it could guide development on the best and most modern lines. A great work lay before them and they were in a position to press their views on the Government; in the future Ireland the Association would play no mean part.

Mr. L. J. Kettle, hon. secretary, submitted the report, which was adopted. It traced the activities of the Association since its formation and the conditions brought about by the change of Government and the establishment of the Free State. They had been informed by the Ministry of Industry and Commerce that it was intended to bring in a new Electricity Control Bill which would not only take the place of the Electricity (Supply) Act of 1919 as appying to Ireland but of the Eectricity Act of 1922, which did not apply to Ireland, and, further, of all previous legislation on the subject of electricity supply. The Association was advised that the only form in which it could put forward its suggestions in a coherent manner would be in the form of a Bill, and it had presented a draft to the Ministry, but the latter had reverted to its original idea of a Government Bill, which would shortly be introduced.

Mr. G. Marshall Harriss read a paper on the future of electricity supply in Ireland and the probable effect thereon of the proposed legislation. In this he urged that they wanted cheap power widely distributed. They had an absurd number of small generating stations in and around Dublin, but the problem of dealing with them was simple as compared with that in England. Cheap power for Ireland was a matter of urgent and vital importance.

A short discussion followed, in which Mr. Harriss's views were endorsed.

The following were elected officers of the Association: President, Mr. Hewat; vice-presidents, Messrs. G. Marshall Harriss and McDowall Grosart; hon. treasurer Mr. Pilditch; hon. secretary, Mr. Kettle; hon. solicitor, Mr. Croskery; Council: Major John Alexander, Messrs. Archer, Cantwell, Fry, Kenny, Mallagh, Myles, Nalder, Price, Ryan, Spalding, Tenham and Wild.

Speaking at the annual luncheon, Mr. Alderman Hubbard Clark reminded the company that the Dublin Corporation was the largest user of electricity in the Free State and it was a matter of congratulation to Mr. Kettle, city electrical engineer, and the Supply Committee, that the citizens were so pleased with the services rendered.

Lord Glenavy (Chairman of the Free State Senate), Professor Purcell (National University), and Colonel Cortez Leigh joined in wishing the Association every success. Later, members and their friends proceeded to the Corporation Electricity Works at Pigeon House Fort, where they were conducted through the various departments by Mr. Kettle.

Electric Water Heating in Canada.—The two largest electric water-heating boilers in the world, manufactured in Winnipeg, were, by the end of July, to be warming the water in the city of Winnipeg's swimming tanks on Cornish and Pritchard Avenues, and supplying hot water for the shower baths. The baths will use no coal whatever, which will do away with a great deal of labour and will mean a saving to the city of several thousand dollars each year. M. Louis G. de Kermor, a Frenchman, who in 1912 patented his method, uses the water itself as a resistance and the steam pressure for the automatic control. Several of the city's hydro sub-stations, a number of city blocks and commercial establishments, and a number of private residences, are heated by this method already.

According to the *Tribune*, these boilers are the basis of the central heating plan of Mr. B. W. Parker, whose application for a franchise is now before the city council. By their use Mr. Parker will be able to control central heating units over a radius, if necessary, of more than ten miles, from one main station. The electrical boilers in the Cornish and Pritchard baths will supply not only hot water for the showers, but steam for warming the tank. They replace four coal furnaces, but the new boilers, which are of 300 kW capacity, occupy less than one-tenth the space of coal furnaces. They are in the form of an upright cylinder of steel plates, seven or eight feet high and about two feet in diameter. Inside the cylinder is a second shell, containing several plates or cylinders of steel. Water rising inside the boiler forms a resistance to the current carried by these plates, which creates heat. Mr. S. S. Vineberg, city hydro-industrial heating engineer, is supervising the installation at the baths. Thermostatic control is used. Water can be raised to any temperature by the boilers, and in the public baths installations could be raised to 280 deg. if so desired.

The boilers store heat. Their consumption of energy is all during the city hydro's "off peak" period, but ordinary householders may make use of these electrical heaters in the same manner as large concerns. The same thermostatic control can be used.

M. de Kermor represents the Dominion Engineering Works, of which the Dominion Bridge Co., of Winnipeg, is a sister firm. His boilers are manufactured at the Winnipeg plant. In his view "it is possible to-day to produce steam by electrical energy with an efficiency of nearly 100 per cent." This installation shows what can be done when electricity is cheap and coal is dear.

A Mercury Flashlight for Photography.—The *Japanese Journal of Physics* contains a paper by Kyoji Suyehiro on an "Electrically deflagrated Mercury Filament as a Flashlight for Instantaneous Photography." In investigations on the taking of photographs of rapidly moving objects Prof. Anderson's experiments on electrically deflagrated wires as a source of light led to a trial of this method with fine tin and copper wires, but the results were not encouraging. Filaments of mercury were tried with success. Mercury is sucked up into a glass capillary tube, and in each end of the tube a "hair wire" is secured with sealing-wax. Thus filaments of any size are easily prepared. The duration of the flash is shorter as the filament is reduced in length and diameter, and it is also affected by the thickness of the wall of the tube. The most intense light is given out by the mercury arc lit just *after* the explosion. The paper is illustrated with photographs of flashes, results of testing their duration by means of a rotating disk with radial lines on it, and applications of the method. Apart from the advantage of this method over the high-pressure spark with regard to its simplicity and safety, its merit lies in the fact that it may be used under water without introducing any complications.

Inquest.—On August 13th, an inquest was held at Bury St. Edmunds into the death of Arthur Graham, an employé at the municipal electricity works. The evidence showed that deceased and another workman were on the roof of the works repairing some overhead wires when the former stepped off the ladder upon the roof, which gave way, allowing him to fall through to the floor. The roof was of asbestos, resting upon girders at intervals of about 5 ft.

A verdict of "accidental death" was returned.

Testing Metals with a Microphone.—Stretching a metal until it squeaks and listening for the squeak with a microphone will give a test showing how much strain that metal can stand as a girder in a bridge or as a rail in a railroad track, according to experiments conducted in the physics department of Lehigh University. The investigators expect that these experiments will develop a novel method of finding quickly and accurately the elastic limit of metals. By this method all forgings may be rapidly tested before they are put into use on construction work.

Several kinds of metals have been used in the Lehigh tests. While professors listened through a sensitive microphone similar to the Dictaphone for the faintest sound, the metal was subjected to a gradually increasing pull until it broke. It was found that squeaking, rasping sounds were produced after the pull had reached a certain definite value, and this value was different for the different metals used. The tests indicated that the sounds were not produced until the elastic limit of the material had been reached. The work will be continued with more refined apparatus in the Lehigh physics laboratory, so that more accurate tests and data concerning the strains that different metals may withstand can be obtained for practical use.—*American Machinist.*

Appointments Vacant.—Charge engineer (69s.) for the Wallasey Corporation Electricity Department; chief assistant in the electrical engineering department, lecturer in mathematics and applied mechanics, and assistant instructor in the mechanical department for the Finsbury Technical College; mains engineer and instrument and inspection engineer (Rs.540 monthly) for the Calcutta Electric Supply Corporation, Ltd.; shift engineer for the Eccles Corporation Electricity Department. (See our advertisement pages to-day.)

Solar Activity and Atmospheric Electricity.—With reference to Dr. Chree's paper on "A Supposed Relationship between Sun-Spot Frequency and the Potential Gradient of Atmospheric Electricity," giving the results of his investigation based on Kew atmospheric-electrical data, Dr. Louis A. Bauer, of the Department of Terrestrial Magnetism, Carnegie Institution of Washington, in a long letter to *Nature* (August 11th) reaches the general conclusion that the relationship between sun-spot activity and atmospheric electricity turns out to be, for locally undisturbed stations, as definite as in the case of terrestrial magnetism; the sun-spot influence on the periodic variations of the atmospheric potential gradient is, in general, as great as on the periodic variations of terrestrial magnetism; and as concerns the effects on the absolute values, the sun-spot influence is about 300 times greater in atmospheric electricity than in terrestrial magnetism. The potential gradient of atmospheric electricity, and, presumably, the earth's total negative electric charge, is furthermore subject to an annual or secular change, which may vary in magnitude and sign from one sun-spot cycle to another.

A Large Sub-station at Seattle.—The city of Seattle has begun the erection of a large sub-station, in which there will eventually be installed six banks of transformers with synchronous condensers and switching equipment. The installation will be fed from the Gorge plant on the Skagit River through two transmission lines approximately 100 miles in length, designed to transmit 90,000 kVA, three-phase, 60-cycle current at 154,000 volts. The transformers feeding the lines at the generating station are rated at 165,000 volts and have permanently grounded neutrals. The initial installation will include the equipment for one incoming transmission line, one transformer bank, and one 15,000-kVA synchronous condenser now being built by the Westinghouse Electric and Manufacturing Co. The step-down transformer bank has three 10,000-kVA transformers with tertiary windings. Both the 154,000- and 26,000-volt lines are connected with permanently grounded neutrals. The tertiary windings are connected in delta at 6,300 volts and are connected to the 15,000-kVA synchronous condenser.

Maltby Colliery Explosion.—The proprietors of the *Sheffield Independent* and *Sheffield Mail* have opened a shilling relief fund for the dependents of the 27 brave men who gave their lives in attempting to safeguard their workmates. There are 22 widows and 57 fatherless children, the latter mostly under 14 years of age. Subscriptions of any number of shillings will be gratefully received at their office, Fargate, Sheffield.

Electricity on Chinese Railway.—Mr. D. O. Bates, the electrical engineer of the Peking-Mukden Railway (Chinese Government Railways), has sent us particulars of the use of electricity upon that system. All the principal stations are electrically lighted generally by means of their own plant, or, in the rest of cases, by local supply authorities. The largest power-producing plant is at the Tongshan Central Mechanical Works. This consists of four steam-driven sets, with an aggregate capacity of 940-kW, and supplies power to 92 motors (1,400 b.h.p.), 97 electric cranes of from 10 to 45 tons lifting capacity, as well as energy for the lighting of the shops. All the machine tools at this works are motor driven, many by their own motors, and the "Quasi-Arc" system of welding is used. Locomotives and coaches are built at the works and when the establishment is fully occupied about 3,000 men are employed. The electrical shops comprise a fitting and machine shop, an armature-winding and light repairs shop, a battery-washing and repairing department, a train-lighting apparatus testing room, an electrical test room, and stores and offices. The system of train lighting employed is that of Messrs. J. Stone & Co., Ltd., and 140 sets are in use. The lighting is carried out in a more lavish style than in this country, as the Chinese like a brilliant light and ornamental fittings. The system has proved very satisfactory.

Many of the locomotives are fitted with electric headlights and it is intended to fit these to all the engines in time. A gasfilled lamp, projecting a beam of light sufficient to define a person at a distance of from 1,000 to 1,500 ft., is used. A small turbo-generator, running at 2,400 r.p.m., supplies current at 32 V for the lamp.

Electricity on Board Ship.—The s.s. *Voltaire*, which was launched at Messrs. Workman, Clark & Co.'s North Yard, on August 14th, built to the order of Messrs. Lamport & Holt, Ltd., of Liverpool, is a very fine vessel, in which full use of electricity is made. The special requirements of the vessel call for an extensive provision of auxiliary machinery, which includes three turbo-generators, each of 90 kW, supplying a system of over 2,000 electric lights, in addition to numerous motors for various services and the electrically-driven fan ventilating system. An emergency engine-driven dynamo is fitted on the boat deck, so that in the event of the engine-room electrical plant failing the lighting and wireless arrangements will not be impaired. This dynamo also supplies power for a powerful motor-driven pump for emergency service. Large air ducts, through which the air is passed by electric fans, are arranged throughout the accommodation and every state-room is fitted with a wall plug, to which a portable electric fan can be attached and set in any part of the room. The domestic arrangements are most up-to-date. Refrigeration and other store-rooms of large capacity are conveniently arranged and the kitchen and pantries contain all the latest electric and steam cooking appliances, as well as a large range and ovens and special grill. Fresh bread can be baked every day in a special double-deck water-tube baker's oven, and the baker's shop is fitted with an electric dough mixer.

INSTITUTION NOTES.

Institute of Transport.—Examination Scheme.—Preparations have now been made for the bringing into operation of an examination scheme in connection with the Institute of Transport. In its August 18th issue *Modern Transport* publishes in full the syllabuses for the graduateship examination and for the traffic section of the associate membership examination. These have been approved by the Council as a first instalment of the scheme and have been prepared with the assistance of representatives of certain of the leading British Universities. Provision is made in the Articles of Association for testing, by examination, the knowledge of applicants for corporate membership and for admission as graduates and students, and the Council has adopted regulations governing examinations, to come into force on October 1st, 1925. If sufficient candidates present themselves earlier, the first examinations might be held during the Institute year, 1923-24.

Iron and Steel Institute.—A list of papers which are to be read at the Milan meeting (September 17th and 18th) has been published, and members are asked to make early application for copies of the papers in which they are interested. At the conclusion of the meeting visits will be arranged to Florence, Rome, Piombino, Leghorn, Genoa, and Turin.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

The *Yorkshire Observer* states that Mr. Lewis Burran, a native of Bradford, who for the past 37 years has been resident in Canada, and has recently retired from the post of chief electrical engineer of the Quebec Railway, Light, Heat and Power Co., is at present in this country. He expects to remain here several months before returning to Canada.

Mr. P. V. Emrys Evans, who has been appointed special representative of Messrs. Vickers, Ltd., South Africa, in association with Messrs. Dowson and Dobson, has arrived in Johannesburg.—*S.A. Mining and Engineering Journal.*

We learn from *Modern Transport* that Mr. W. J. Thorrowgood has recently been appointed signal and telegraph superintendent of the Southern Railway Co. Mr. Thorrowgood has been intimately associated with the development of telegraphs, telephones, track circuits and power signals on the former London and South-Western Railway. He installed the first alternating-current track circuit in this country at Richmond, Surrey, in 1908, and two years ago he installed at Waterloo the first automatic telephone switchboard on any British railway, the system at Southampton and Eastleigh having since been installed on the same principles. In 1900 Mr. Thorrowgood was in charge of the telegraph department at Waterloo and three years later was appointed chief technical assistant in the telegraph department of the London and South-Western Railway. In 1908 he became general assistant for signals and telegraphs, and in 1912 was made assistant signal and telegraph engineer. In 1918 he became acting signal and telegraph superintendent, and two years later signal and telegraph superintendent. Mr. Thorrowgood has taken an active interest in technical education, having lectured on physical science and electro-technology for fourteen years at the Regent Street Polytechnic. He has also established a signal school at Wimbledon for the use of the company's staff. He is a member of the Institution of Electrical Engineers, a member of the Institute of Transport, and vice-president of the Institution of Railway Signal Engineers.

Mr. D. Jenkins, M.Sc.Tech., A.M.I.E.E., has relinquished his position as manager of the Swansea District for the Metropolitan-Vickers Electrical Co., Ltd., and has entered into partnership with Messrs. P. J. Plevin & Partners, consulting engineers, of Cardiff. Mr. Jenkins is widely known in the South Wales Coalfield, and possesses extended experience (in this country and in Germany) in the power requirements of the steel and coal industry.

At last week's meeting of the Southport Town Council a recommendation by the Electricity Committee that the salar of Mr. E. Moxon, the borough electrical engineer, be raised from £800 to £900 immediately, and finally to £1,000 by two equal increments of £50 was approved. The matter was referred to in our last issue.

Mr. H. H. Couzens, who has recently been elected president of the Canadian Electric Railway Association, is general manager to the Toronto Transportation Commission. He was formerly associated with the West Ham and Hampstead municipal electricity supply undertakings before going to Canada in 1912 to take up the position of general manager of the Toronto hydro-electric undertaking.

Mr. A. H. Darker, chief electrical engineer of Messrs. J. Stone & Co., Ltd., London, who has been making a business tour round the world, has now returned to England.

NEW COMPANIES REGISTERED.

Revalco, Ltd. (191,871).—Private company. Registered August 13th. Capital, £3,500 in £1 shares. To carry on the business of wireless, radio, and electrical engineers, manufacturers of, and dealers in all kinds of electrical apparatus, &c. The subscribers (each with one share) are :—W. Sanders, 20, Fetter Lane, E.C.4, engineer; F. J. Browse, 13, Davenport Road, S.E.6, engineer. The subscribers are to appoint the first directors. Remuneration as fixed by the company. Registered office: 15, Grape Street, Shaftesbury Avenue, W.C.2.

Hightensite and Ebonite Manufacturing Co., Ltd. (191,936).—Private company. Registered August 16th. Capital, £15,000 in £1 shares. To take over the business of manufacturers of ebonite and a certain material sold under the trade mark or name "Hightensite," carried on by Hightensite, Ltd., together with the freehold land, buildings, machinery, plant, and other property connected therewith, and the trade mark No. 373,219, and to carry on the business of manufacturers, importers, and exporters of, and dealers in the said material, ebonite, vulcanite, and all kinds of hard and other rubber, gutta percha, balata, and other like substances, leather, hides, wood, fibre, asbestos, textile material, &c. The first directors are :—Sir Robert L. Powell, Kt., "Heatherbank," Chislehurst; G. G. Powell, "Heatherbank," Chislehurst; B. T. Comins, Pembroke House, Bromley, Kent. No qualification required. Secretary: W. J. Wesson. Registered office: 54, Conduit Street, W.1.

Peronet, Ltd. (191,870).—Private company. Registered August 13th. Capital, £1,000 in £1 shares. To carry on the business of wireless, telegraph, telephone, and general engineers, manufacturers of, and dealers in machinery, plant, hardware, &c. The permanent directors are :—C. B. Millett, 13, Grange Gardens, Eastbourne (chairman and managing director); C. H. T. Pelmear, 10, Bedford Place, W.C.1 (engineer). Qualification of permanent directors, 100 shares; of other directors, 200 shares. Registered office: 38, Bloomsbury Square, W.C.1.

Wates Bros., Ltd. (191,876).—Private company. Registered August 13th. Capital, £5,000 in £1 shares (3,500 preference and 1,500 ordinary). To take over the business of a manufacturer of, and dealer in all kinds of electrical and scientific apparatus and instruments carried on by F. S. S. Wates at 13 and 14, Great Queen Street, Kingsway, W.C.2, as "Wates Bros.," and to carry on the same and the business of manufacturers and factors of, agents and concessionaires for, and dealers in components and appurtenances to motors, cars and cycles, aircraft, telegraphs and telephones, and in all apparatus connected with wireless telegraphy, gramophones, and the like. The subscribers (each with one share) are :—Dorothy Inns, 73, Hayter Road, Brixton Hill, S.W., confidential clerk; E. W. Lindley, 105, Elthorne Road, N.19, electrical engineer. The subscribers are to appoint the first directors. Qualification, £100. Remuneration as fixed by the company. Solicitors: C. C. Dennis, 3, Lincoln's Inn Fields, W.C.

Whitby & Chandler, Ltd. (191,878).—Private company. Registered August 13th. Capital, £3,000 in £1 shares. To carry on the business of rubber manufacturers and dealers in rubber accessories, asbestos, brass, iron, gutta percha, ebonite, mica, linoleum, upholstery, electrical and other machinery, &c. The first directors are :—T. Chandler, 54, Westwood Road, Sheffield, rubber manufacturer; W. Whitby, 410, Ecclesall Road, Sheffield, rubber manufacturer. Qualification, 250 shares. Remuneration as fixed by the company. Secretary: W. R. Proctor. Registered office: 30, The Wicker, Sheffield.

Northern General Suppliers, Ltd. (191,914).—Private company. Registered August 15th. Capital, £1,000 in £1 shares. Manufacturers of, agents for, and dealers in wireless sets and instruments or parts, and all other electrical goods for lighting, heating, telephony or telegraphy; manufacturers of, and dealers in incubators, motor-cars, cycles, tires and accessories; agents for, manufacturers of, and dealers in apparel, furniture, china, glass, cutlery, silver or silver plate, bed linen, and all other articles of general household utility, mail carts, pianos, gramophones, and musical instruments; manufacturers of, and dealers in sports requisites, photographic materials, cameras, lenses, and general photographic supplies, &c. The subscribers (each with one share) are :—W. Pashby, 12, Egerton Street, Sheffield, motor driver; Alice Turner, 81, Lancing Road, Sheffield, commercial clerk. The first directors are to be appointed by the subscribers. Qualification: 10 shares. Solicitors: W. L. Oxley, 12, Paradise Square, Sheffield.

W. P. T., Ltd. (191,875).—Private company. Registered August 13th. Capital, £150 in £1 shares. To manufacture, deal in, and install plant, machinery, apparatus, instruments, appliances, and tools for the transmission of electricity or electric power with or without the use of wires, cables, or other conductors, and for the direction and checking of electrical energy distributed without such conductors, &c. The subscribers (each with one share) are :—W. H. White, 15, Bedford Row, W.C.1, solicitor; Elsie M. Weller, 15, Bedford Row, W.C.1, clerk. The first directors are not named. Registered office: 15, Bedford Row, W.C.1.

Accumulator Charging Co., Ltd. (191,901).—Private company. Registered August 15th. Capital, £1,000 in 950 participating preference shares of £1 and 1,000 ordinary shares of 1s. To enter into contracts to supply electricity, or to supply, fix, or maintain all electric generators, batteries, lamps, engines, motors, converters, meters, or other electrical plant and appliances, &c. The provisional directors are :—C. P. Stromeyer, "Lancefield," West Didsbury, Manchester, mining engineer; W. Morris, 45, Sillwood Road, Brighton, retired civil servant. Solicitors: Ashurst, Morris, Crisp & Co., 17, Throgmorton Avenue, E.C.2.

Regent Radio Co. (961).—Registered August 14th. Makers and sellers of radio apparatus, Biscot Road, Luton. Partnership for five years from June 25th, 1923. General partner: J. F. Mongiardine, 38, Conway Road, Luton. Limited partners: P. J. Oliver, Wigmore Hall, near Luton; and A. R. Oliver, New Mill End, near Luton, contributing £200 each in cash.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Liverpool Electrical Engineering Co. (1923), Ltd.—Particulars filed of £800 debentures authorised July 25th (also pursuant to an agreement dated June 12th, 1923), charged on the company's undertaking and property, present and future, including unpaid capital, the whole amount being now issued.

Ackroyd & Best, Ltd.—Issue on July 30th, 1923, of £1,500 debentures, part of a series already registered.

Yera Electrical, Ltd.—Particulars filed of £200 debentures authorised July 23rd, 1923, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £125.

British Illuminated Sign Co., Ltd. (Old Company).—R. Stephens, of 31, Lombard Street, E.C.3, ceased to act as receiver or manager on July 31st, 1923.

Hart Accumulator Co., Ltd. (60,059).—Return dated May 30th, 1923. Capital, £200,000 in 180,000 ordinary and 20,000 preference shares of £1 each. 156,708 ordinary and 19,523 preference shares taken up. £38,411 paid on 31,352 ordinary and 7,059 preference shares. £137,820 considered as paid on the remainder. Mortgages and charges, nil.

Melton Mowbray Electric Light Co., Ltd. (53,018).—Return dated May 4th, 1923. Capital, £25,000 in £5 shares. 4,000 shares taken up. £20,000 paid. Mortgages and charges, £19,100.

Swedish General Electric, Ltd. (111,849).—Return dated July 6th, 1923. Capital, £5,000 in £1 shares. All shares taken up. £5,000 paid. Mortgages and charges, nil.

Brush Electrical Engineering Co., Ltd. (29,533).—Return dated April 30th, 1923. Capital, £600,000 in £1 shares. 458,563 shares taken up. £1 per share called up on 297,388 shares. £297,384 5s. paid, leaving £3 15s. in arrears. £161,175 considered as paid on 161,175 shares. Mortgages and charges, £306,677 18s.

Metropolitan-Vickers Electrical Co., Ltd. (62,919).—Return dated April 12th, 1923. Capital, £6,395,000 in 616,525 preference shares of £2 each, 5,136,950 ordinary shares of £1 each, and 500,000 deferred shares of 1s. each. 616,525 preference, 1,136,950 ordinary, and 500,000 deferred shares taken up. £2 per share called up on 541,525 preference, £1 per share on 1,136,950 ordinary, and 1s. per share on 500,000 deferred shares. £2,245,000 paid. £150,000 considered as paid on 75,000 preference shares. Mortgages and charges, £1,036,353.

Barford Electric Supply Co., Ltd. (137,994).—Return dated May 29th, 1923. Capital, £5,000 in 3,000 ordigary shares of £1 each and 4,000 preference shares of 10s. each. 1,300 ordinary and 2,200 preference shares taken up. £2,300 paid. Mortgages and charges, £700.

British Engineering Units, Ltd.—Particulars filed of £1,500 debentures authorised July 31st, 1923, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Richard Whaley, Ltd.—Debenture dated August 2nd, 1923, to secure £666, charged on the company's undertaking and property, present and future, including uncalled capital. Holders: W. C. Barraclough, 61, Bridge Street, Manchester; and G. W. Tempest, 19, Hopwood Avenue Manchester.

Wireless Accessories Stores, Ltd.—Debenture dated July 17th, 1923, to secure £200, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. Martin, "Melrose," Finchley Park, North Finchley.

Leeds Flint Glass Co., Ltd.—Particulars filed of £2,000 second mortgage debentures authorised August 9th, 1923, charged on the company's undertaking and property, present and future, including uncalled capital (subject to £10,200 first mortgage debentures created February 1st), the amount of the present issue being £700.

Scarborough South Cliff Tramway Co., Ltd.—Debentures dated December 20th, 1889, securing £1,000 and included in a filed statement of secured debts (erroneously stated therein as dated December 22nd, 1889) were satisfied to the extent of £200 on June 21st, 1923.

Anglo-Portuguese Telephone Co., Ltd. (24,545).—Return dated June 15th, 1923. Capital, £500,000 in £1 shares. 400,000 shares taken up. £301,046 paid. £98,954 considered as paid. Mortgages and charges, £74,170.

Electromotors, Ltd. (60,826).—Return dated June 21st, 1923. Capital, £100,000 in £1 shares. 84,740 shares taken up. £81,740 paid. Mortgages and charges, nil.

West London and Provincial Electric Supply Co., Ltd. (62,097).—Return dated May 2nd, 1923. Capital, £150,000 in £1 shares (70,000 ordinary and 80,000 preference). 23,354 ordinary and 49,077 preference shares taken up. £57,431 paid, being £1 per share on 15,854 ordinary and 41,577 preference. £15,000 is considered as paid on 7,500 ordinary and 7,500 preference. Mortgages and charges, nil.

CITY NOTES.

Spanish Companies.

The *Industria Electrica* (*Siemens Schuckert*) of Madrid, reports net profits of 430,000 pesetas for 1922 and the dividend on the share capital of 4,500,000 pesetas is at the rate of 8 per cent., as in 1921.

The report of the *Tudor Accumulator Co.*, of Madrid, states that the production of Tudor accumulators largely increased in 1922, the orders received from the Portuguese Tudor Co. having contributed towards the augmentation. All the market requirements in stationary batteries in Spain were supplied by the company and an increase also took place in the sales of portable batteries. Special attention was devoted to the development of electric traction by means of road vehicles and to the production of batteries for submarines for the Navy. The net profits are returned at 627,000 pesetas and the dividend is at the rate of 11 per cent. on the share capital of 3,750,000 pesetas.

Dutch Company. The report of the *Hengelesche Electrische en Mechanische Apparaten Fabriek* (*Heemaf*) of Hengelo, dealing with the year ended on April 30th, 1923, states that the demand in the inland market largely declined and the turnover in the Dutch East Indies also decreased, while at the same time orders were only obtainable at very low prices in the face of German competition. During the year the exports increased more than two-fold, despite the unfavourable prices, and these afforded partial compensation for the falling-off in Holland and the East Indies. The augmentation in the turnover necessary for rendering manufacturing profitable must be derived from a further extension of the export trade, and it is thought that this result will be obtained in the new financial year unless hindered by import vetoes or higher duties and alterations in exchange in the importing countries. The greatest difficulty lies in the considerable difference between wages and working expenses in surrounding countries and those prevailing in Holland. Orders, both for Holland and the East Indies, were received by the company for traction material in co-operation with the Westinghouse Electric Co., and the former would soon be able to deliver almost complete equipment. After having made provision for depreciation the accounts, according to a Rotterdam news- recommend a dividend at the rate of 7 per cent. for the year, carrying forward £2,961.

Tyneside Tramways and Tramroads Co.—The half-yearly meeting was held at Newcastle on August 14th, Mr. G. E. Henderson presiding. In presenting the report, which was abstracted in our issue of August 10th (p. 221), the chairman said it was regretted that the results of the half-year had not been such as to justify a dividend on the ordinary shares. The receipts had shown a considerable decrease owing to the depressed state of Tyneside industry, and the gross profit had decreased by £1,006 as compared with that of the equivalent period of last year. The report was adopted.

East London Railway Co.—The Court has sanctioned the company's scheme for the distribution of a sum of £133,367, representing the compensation award from the State. This scheme includes the payment of 16 per cent. on the second charge 4 per cent. debenture stock, 6 per cent. on the third charge debenture stock, and 2 per cent. on the fourth charge debenture stock, all of which will be subject to income tax at 4s. 6d. in the pound.

Aberdeen Suburban Tramways Co., Ltd.—Profit for half-year ended July 31st, £1,848, making £5,247. Directors recommend a dividend at the rate of 7 per cent. for the year, carrying forward £2,961.

Companies Struck off the Register.—The names of the undermentioned companies have been struck off the register and they are hereby dissolved :—

Accumulator Trust, Ltd.
British Electrical Winders, Ltd.
Veitch Institute of Electro-Therapeutics, Ltd.

Mansfield and District Tramways Co., Ltd.—Usual half-yearly dividend on preference shares and interim dividend on ordinary of 3 per cent.

Hadfields, Ltd.—The directors intimate that, having regard to the general position and the uncertain outlook in the steel trade, they have decided not to make an interim distribution on the ordinary shares, but to await the result of the complete year.

Whitehall Electric Investments, Ltd.—It is reported that the company has purchased the share capital of two companies, whereby it acquires the tramway, lighting and power systems of Valparaiso, Chile, and the La Florida hydro-electric undertaking situated near Santiago, Chile.

Stock Exchange Notices.—Application has been made to the committee to allow the following to be officially quoted :—

Hadfields.—£1,040,000 5½ per cent. first mortgage debenture stock.
St. Maurice Power Co.—£200,000 first mortgage 30-year 6½ per cent. sinking-fund debenture stock.

Davis & Timmins, Ltd.—Interest on 6 per cent. preference shares and interim dividend on ordinary shares at the rate of 6 per cent. per annum, free of tax, for the half-year ended June 30th.

Lancashire Dynamo and Motor Co., Ltd.—Interim dividend on the preference but no interim distribution on the ordinary shares.

Brompton & Kensington Electricity Supply Co., Ltd.—Interim dividend on the ordinary shares at the rate of 10 per cent. per annum, tax free.

J. Stone & Co., Ltd.—Dividend of 10 per cent. on the ordinary shares for 1922, carrying forward £147,590, after placing £50,000 to reserve.

South Metropolitan Electric Light and Power Co., Ltd.—Usual interim dividends on preference shares and an interim dividend on ordinary shares at rate of 4 per cent., less tax.

Charles Clifford & Son, Ltd.—Interim dividend of 10 per cent. per annum (free of tax) on ordinary shares.

STOCKS AND SHARES.

Tuesday Evening.

The holiday season notwithstanding, a good deal of business continues to make its way into Stock Exchange markets, and foreign politics are bulking less largely in the foreground than was the case a fortnight ago. Cable stocks continue on the up-grade. Electricity Supply prices are a trifle irregular. Underground income bonds have at length reached par. Edisons are rather harder.

County of London Electric ordinary have risen to 2½, at which price the yield on the money is barely 4¾ per cent.—the least return offered by any of the ordinary shares in the list. Obviously, there must be some reason for this, and the shareholders are not likely to part with their investments in the face of the persistent buying. It is interesting to observe that the new shares, offered in May last year, stand at nearly £1 premium.

Westminsters are 2s. 6d. lower at 9¼, and Charing Cross at 11½ are similarly easier. Edmundson's have braced up to 3 3-16. City Lights keep good at 49s. 6d. No change occurred in Whitehall preference on the announcement that the company had acquired a further hydro-electric installation through the purchase of another Chilean undertaking. The 6 per cent. debentures are, however, firmer at 97¼. Yorkshire Electric Power ordinary have improved to 26s. 3d.; the 6 per cent. preference change hands at the comparatively high price of 23s. 7½d., but this is *cum* a full 7 1-5d. dividend. Shropshire 7½ per cent. convertible debenture has been done at 103 and 101¼.

Amongst the newer issues, Lima Light & Power 6 per cent. debentures, with £55 paid and another £35 due before they become paid up in full, recovered to 2½ discount after their drop to 3 discount. English Electric 6 per cent. debentures are 8 premium. Tokio Sixes are better at ¾ premium. Enfield Ediswan 7½ per cent. preference remained at about 6d. discount, and Electric Supply 6 per cent. preference at 3d. discount. Both these two last-named came out at £1. Urban 6½ per cent. debentures are 2½ premium, and there is a discount of 10s. on the South Wales Power 6 per cent. debentures, which were offered at 98.

Automatic Telephones came into demand up to 19s. 6d. by reason of the contract just placed with the company for the supply of automatic telephone exchange equipment for 50,000 subscribers' lines, and a large junction exchange. These installations, it is decided, will form the nucleus for the conversion of the entire London telephone system to automatic operation. This makes pleasant reading, also, for the holders of International Automatic Telephones, the price of which has risen to 16s., while the 7 per cent. preference gained a few pence at 20s. 9d. No dividend has been paid on the Automatic ordinary since March, 1919, when 6 per cent. was distributed in respect of the preceding year.

Eastern Telegraph is 2 points higher at 175, and although the three other members of the group show no nominal changes, the market is better, as the would-be buyers discover when they try to pick up cheap stock. Great Northerns have lost 10s. Anglo-American deferred gained the fraction at 23¼. Falls of 5s. lowered United River Plates and Chile Telephones to 6¼ and 5¾ respectively.

President Obregon's Government has been recognised, after constant rupture of negotiations, by the United States, and Mexican securities are slightly better as a consequence. This should result in a noticeable impetus to Mexican trade. It should pave the way to an influx into Mexico of American capital. It should set at rest the doubts and fears which for too long a time have hampered development of the unhappy country. But there have been so many cries in the past of "Peace," when no peace has materialised, that people are afraid of putting too great faith in the immediate outlook. Mexican Utility prices are a little better, the rallies being very modest as compared with the falls that have taken place recently.

Anglo-Argentine Tramways preferences of both kinds are lower, for which dividend fears are responsible. The seconds have dropped to 46s. 3d. Brazilian Tractions are a point down at 48, the rate of exchange being so unsatisfactory. In the Home list, British Electric Traction preference hardened to 100¼. London United Tramways ordinary changed hands the other day at 3d. each, and Metropolitan Electric Tramways 5 per cent. preference at 7s.

Underground Electric Railways income bonds, as already noted, have regained their par price of 100, the assumption being that the full 6 per cent. dividend is virtually assured. It is paid, of course, free of income tax. Metropolitan ordinary at 69 and Districts at 48 are 10s. higher and lower respectively. The continual pin-pricks about possible labour trouble are held to be the chief reason for the public's disinclination to pay much attention to the stocks of the steam railway companies.

Babcock & Wilcox recovered the decline of last week. Callender's are 1-16 off to 2¼. Edisons' rise to 4s. 9d. reflects the speculative interest that attaches to the shares. General Electric preference went back 1s. to 22s. 3d. India Rubber shares have been done at 10s. 3d. The rubber market keeps good, on account of the firmness exhibited by the raw material; iron, steel and armament descriptions are quiet, presenting no new points of interest.

SHARE LIST OF ELECTRICAL COMPANIES.

	Nom.	Dividend. 1921.	Dividend. 1922.	Price Aug. 21, 1923.	Rise or fall.	Yield p.c.
Home Electricity Companies.	£					
Brompton Ordinary	1	12	12	1½	–	£6 2 6
Charing Cross Ordinary	5	9	14	11½xd	– ½	6 5 10
do. do. do. 4½ Pref.	5	4½	4½	4½	–	5 6 0
Chelsea	1	6	10	34/-	–	5 17 8
City of London	1	14	15	2½	– 1/16	6 1 0
do. do. 6 % Pref. ...	1	6	6	24/-	–	5 4 4
County of London	1	8	10	2½	+ ½	4 14 1
do. do. 6 % Pref. ...	1	6	6	23/9	–	5 1 1
Edmundson's Ordinary	3	Nil	7	3 1/16	+ 1/16	6 0 7
do. 6 % Pref	5	12/-	6	4½	–	6 8 0
Kensington Ordinary	5	10	12	9½	–	6 11 4
London Electric	3	4	10	4½	–	7 1 7
do. do. 6 % Pref. ...	5	6	6	5⅛	–	5 11 7
Metropolitan	1	7	8½	1 13/16	–	5 6 3
do. 4½ % Pref.	1	4½	4½	17/6	–	5 1 5
Newcastle-on-Tyne Ordinary ...	1	Nil	2½	17/-	–	2 18 10
do. 5 % Pref. ...	1	5	5	16/3	–	6 3 1
do. 7 % Pref. ...	1	7	7	24/-	–	5 16 8
Notting Hill 6 % Pref.	10	6	6	9½	–	6 9 9
North Met. Elec. 6 % Pref. ...	1	6	6	22/-	–	5 9 1
Urban Ordinary	1	Nil	—	15/-	–	Nil
do. 5 % Pref. ...	1	2½	5	⅛	– 1/16	6 17 0
St. James' and Pall Mall ...	5	12	14½	11½	–	6 9 6
South London	1	7	10	1½	–	5 14 4
South Metropolitan Pref. ...	1	7	7	1½	–	5 12 0
Westminster Ordinary	5	10	12	9½	– ½	6 11 9
Whitehall Elec. Invst., 7½ % Pf.	1	7½	7½	19/9	–	7 18 10
Home Rails.						
Central London Ord. Assented	Stock	4	4	74	–	5 8 1
Metropolitan	,,	2½	3½	69	+ ½	5 1 5
do. District	,,	1	3	48	– ½	6 5 0
Underground Electric Ordinary	10	Nil	Nil	2¼	–	Nil
do. do. "A" ...	1	Nil	Nil	8/6	–	Nil
do. do. Income Bonds	4	5	100		+1	*5 0 0
Telegraphs and Telephones.						
Anglo-Am. Tel. Pref.	Stock	6	6	101	–	5 18 10
do. Def.	,,	1½	34/6	23½	+ ½	6 9 0
Chile Telephone	5	6	6	5⅝	– ½	5 2 2
Cuba Sub. Ord.	10	7	7	7½	–	9 6 8
Eastern Extension	10	10	10	17½	–	5 16 0
Eastern Tel. Ord.	Stock	10	10	175	+2	5 14 4
Globe Tel. and T. Ord.	10	10	10	17½	–	5 16 0
do. do. Pref.	10	6	6	11	–	5 6 6
Great Northern Tel.	10	24	22	26½	– ½	8 6 0
Indo-European	25	10	7	33½	–	5 4 6
Marconi	1	25	15	2 1/16	–	6 9 10
Oriental Telephone Ord. ...	1	12	12	1⅝	–	*6 8 0
United R. Plate Tel.	5	8	8	6½	– ½	*6 3 1
West India and Panama ...	10	Nil	Nil	1/6	–	Nil
Western Telegraph	10	10	10	17½	–	*5 16 0
Home and Foreign Trams, &c.						
Anglo-Arg. Trams. First Pref.	5	5½	12½	2⅝	– ⅛	9 11 4
do. do. 2nd Pref.	5	Nil	5½	2 1/16	– ⅛	11 17 10
do. do. 5% Deb.	Stock	5	5	72½	–	6 18 0
British Electric Traction Ord.	,,	4½	5	74½	–	6 16 1
do. do. 6 % Pref.	,,	6	6	100½	+ ½	5 19 3
Brazil Tractions	100	Nil	4	48	–1	8 3 4
Brit. Columbia Elec. Rly. Pcs.	Stock	5	5	86½	–	5 15 7
do. do. Preferred	,,	5	96/-	81½	–	*5 18 9
do. do. Deferred	,,	8	127/-	89½	–	*7 2 6
do. do. Deb. ...	,,	4½	4½	80½	– ½	5 5 7
Lond. & Sub. Trac. 5 % Pref.	1	3½	5	9/6	–	10 10 6
London United Tram. Deb. ...	Stock	4	4	61½	–	6 10 0
Mexico Trams. 5 % Bonds ...	—	Nil	Nil	75	+1	6 13 4
do. 6 % Bonds ...	–	Nil	Nil	56½	–	Nil
Mexican Light Common ...	100	Nil	Nil	26½	+1	Nil
do. Pref.	100	Nil	Nil	53½	+1½	Nil
do. 1st Bonds ...	—	Nil	5	61½	–	8 2 8
Manufacturing Companies.						
Babcock & Wilcox	1	15	20	2 1/16	+ 1/16	4 11 4
British Aluminium Ord. ...	1	10	5	18/3	–	5 9 7
British Insulated Ord.	1	15	15	2½	–	6 5 0
Callenders	1	15	15	2⅜	– 1/16	6 6 4
do. 6½ Pref.	1	6½	6½	23/9	–	5 9 5
Crompton Ord.	1	10	5	1/16	–	8 17 6
Edison-Swan	1	10	Nil	4/9	+6d.	Nil
do. do. 5% Deb.	Stock	5	5	65	–	7 13 10
Electric Construction	1	10	10	1 1/16	–	6 16 1
English Electric	1	8	5	17/9	–	5 12 8
do. do. Pref.	1	6	6	19/6	+6d.	6 3 0
Gen. Elec. Pref.	1	6½	6½	22/3	–1/-	5 16 10
do. Ord.	1	10	5	18/6	–	5 8 3
Henley	1	15	15	2 1/16	–	6 9 10
do. 4½ Pref.	5	4½	4½	4⅜	–	5 2 10
India-Rubber	1	10	—	1/16	–	—
Met.-Vickers Pref.	2	8	8	2½	–	6 8 0
Siemens Ord.	1	10	10	1/16	–	Nil
Telegraph Con.	12	20	20	25	–	*4 17 0

* Dividends paid free of Income Tax.

MARKET QUOTATIONS FOR CHEMICALS AND METALS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances.

CHEMICALS, &c.		Price Aug. 22nd.	Fortnight's Inc. or dec.
a Acid. Oxalic	per lb.	6d.	...
a Ammoniac, Sal	per ton	£60	...
a Ammonia, Muriate (large crystal)	,,	£52	...
a Bisulphide of Carbon	,,	...	...
a Borax	,,	£27	...
a Copper Sulphate	,,	£25 10s.	20/- dec.
a Potash, Chlorate	per lb.	4d. to 4½d.	...
a ,, Perchlorate	,,	4d.	...
a Shellac	per cwt.	£13 10s.	...
a Sulphur, Sublimed Flowers ...	,,	£8 10s.	...
a ,, Roll	,,	£8	...
a Soda, Chlorate	per lb.	3d.	...
a ,, Crystals	per ton	£5 10s.	...
a Sodium Bichromate, casks ...	per lb.	4½d.	...
METALS, &c.			
b Aluminium, Ingots	per ton	£115 to £120	...
b ,, Wire	per lb.	1/9 to 2/6*	...
b ,, Sheet	,,	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—			
Grade I	per ton net	£176	£4 inc.
Grade II	,, ,,	£126	£2 inc.
Grade III...	,, ,,	£72	£1 inc.
c Brass (rolled metal 2" to 12" basis)	per lb.	10d.	...
c ,, Tubes (solid drawn) ...	,,	1/0 to 1/0½	...
c ,, Wire, basis	,,	10½d.	...
c Copper Tubes (solid drawn) ...	,,	1/1½d.	½d. dec.
c ,, Bars (best selected) ...	per ton	£98	£2 dec.
c ,, Sheet	,,	£98	£2 dec.
c ,, Rod	,,	£98	£2 dec.
d ,, (Electrolytic) Bars ...	,,	£70 15s.	20/- dec.
d ,, ,, Sheets ...	,,	£145 10s.	...
d ,, ,, Wire Rods	,,	£80 15s.	20/- dec.
d ,, ,, H.C. Wire	per lb.	10½d.	½d. dec.
f Ebonite Rod	,,	3/6	...
f ,, Sheet	,,	3/-	...
n German Silver Wire	,,	2/3	...
h Gutta-percha, fine	,,	6/6	...
h India-rubber, Para fine	,,	1/3	...
l Iron Pig (Cleveland Warrants) ...	per ton	92s. 6d.	...
l ,, Wire, galv. No. 8, P.O. qual.	,,	£25	...
g Lead, English Pig	,,	£25 10s.	5/- inc.
g Mercury	per bot.	£9 2s. 6d.	17/6 to 22/6 dec.
e Mica (in original cases) small ...	per lb.	3d. to 3/-	...
e ,, ,, medium...	,,	4/- to 8/-	...
e ,, ,, large ...	,,	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings	,,	1/2	...
p ,, drawn bars and rods	,,	1/3½	...
p ,, rolled strip & sheet	,,	1/3½	...
p ,, wire	,,	1/3½	½d. dec.
o Platinum	per oz.	£23	...
d Silicium Bronze Wire	per lb.	1/1½	...
r Steel, Magnet, in bars	,,	10d.	...
n Tin, Block (English)	per ton	£190 10s.	£4 15s. to £5 inc.
n ,, Wire, Nos. 1 to 16	per lb.	3/-	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
l Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

The Case for the Tramway.—A report, in which the relative merits and demerits of tramways and omnibuses are set out, has been presented to the Manchester City Council by Mr. Henry Mattinson, the general manager of the city's tramways. In reply to those who desire to see the removal of the tramways from the centre of the city, putting forward London as an example, Mr. Mattinson calls attention to the difference between the areas involved. He shows that the area involved in Manchester is far too small for the institution of another method of transportation, and the changing of passengers from one vehicle to another would be a source of annoyance to all concerned. The report states that the substitution of motor omnibuses for the tramways would lead to a 61 per cent. increase of fares, and owing to their smaller seating capacity 870 'buses would be required to take the place of 590 tramcars. In inclement weather, owing to the open top deck, 1,300 'buses would be needed. The cost of substitution would be in the neighbourhood of £2,000,000, and this would not be offset by the sale of the tramway system, as the cost of the removal of the latter would be too great and the cars would not realise very much. In addition, the outstanding debt of the tramways would have to be taken over by the 'buses, which would mean an extra charge of 1.034d. per 'bus-mile. The loss to the rates caused by the removal of the track would amount to £52,000 per annum. The omnibus system could only be financially successful if an average fare of 1d. for .94 mile were charged; on the tramways a distance of 1¼ miles can be travelled for a penny.

Fires.—Damage was done by fire on August 16th at the power-house which supplies the energy for the works of Scotts' Foundry, East Stewart Street, Greenock.

On August 14th the electric power-house at Roebuck House, Clonskeagh, the residence of Mrs. Despard, was destroyed by fire.

WATER-POWER STUDIES.—V.

Reporting on a Water-Power Project.

By WILLIAM T. TAYLOR, M.Inst.C.E., M.I.E.E., M.Am.Soc.C.E.

(*Concluded from page* 263.)

When all the technical features have been worked out, detailed costs (which should be embodied in the main report) are then drawn up. For instance, assuming we are quite satisfied (from studies originally made) that the specified amount of power really is available, that no unusual engineering difficulties are involved, that the immediate power market looks fairly good, that the cost of all necessary land, expense of buying out vested interests, cost of complete issue of concessions, &c., is reasonable, then, neglecting a knowledge of the terms upon which capital can be obtained (usually a question decided by others, not the investigating engineer), the *capital cost and fixed charges for* the project would be drawn up and would ordinarily include:—

(*a*) Estimated total cost of concessions and land for the entire development, cost of buying out vested interests, &c.

(*b*) Estimated total cost of surveys, clearing of sites, loss of amenity, &c.

(*c*) Estimated cost of providing all necessary construction plant, houses and hutments for construction staff and men, stores, offices, &c. Cost of making, relocating, and rebuilding roads and railroads to the hydraulic works for transport of materials, plant, &c.

(*d*) Estimated cost of unwatering; cost of coffer dam; cost of construction plant, &c.

(*e*) Estimated cost of dam, bridge over spillway overflow, scour, channel to permit of water level of reservoir being lowered, gate towers, gates and operating gear, pipes, screens, racks, &c.

(*f*) Estimated cost of constructing conduit, including cost of constructing diversion dam and headworks, with spill-weir, gates, screens, racks, &c.

(*g*) Estimated cost of constructing settling basins, siphons, and aqueducts (if any).

(*h*) Estimated cost of constructing forebay, including cost of allocated plant for concrete mixing, cost of gates, gate-house, racks, screens, &c. Or, estimated cost of constructing surge tank in lieu of, or in addition to, the forebay.

(*i*) Estimated cost of pressure pipe line with anchor blocks and bolts, supports, bends, control gates, expansion joints, air-inlet valves, Venturi meters, &c.

(*j*) Estimated cost of generating station building, machine shop, fitting and fixtures, &c.

(*k*) Estimated cost of hydraulic and electrical plant, apparatus, equipment, auxiliaries, machine tools, piping, &c.

(*l*) Estimated cost of constructing the tail-race, weir, &c.

(*m*) Estimated cost of erecting dwelling-houses for the permanent staff and operators, stores, &c.

(*n*) Estimated cost of legal and engineering charges, expenses of supervision, contingency allowance, and interest allowed during construction period, &c., including cost of obtaining the authority of a Private Bill.

The *estimated annual costs* would include redemption of capital, also renewal of plant and general working charges in connection with the hydro-electric plant, apparatus, equipment, &c. The allowance for depreciation and maintenance of works would, of course, vary with the type and character of development, civil engineering works and plant, &c. In this text it would be unsafe to give *one set* of figures to cover every type and class of development. At the best it would be a very rough guide for the reason that depreciation and maintenance costs depend on such matters as the quality of material used and on the grade of engineering, workmanship, and management; moreover, these costs depend on the length, size, type, character and structure, slope of waterways, velocity of flow, climatic conditions, voltage, factor of safety, &c. The annual costs would also include the salary of staff and wages of all operators, clerical and casual assistance, expense of administration, general stores, oil, waste, and other incidental expenses. It would also include insurance on buildings and plant, &c., and workmen's compensation insurance. For interest on invested capital (allowing for sinking fund charges so as to redeem the capital in a given number of years), the annual instalment would be reinvested at a given percentage. In the estimated cost of current per kWh there would be included allowances for redemption of capital and, perhaps, payment of dividend on the principal sunk in the development.

One of the most interesting parts of a water-power report is usually the presented physical data in the form of maps and photographs. These maps, plans, and photographs should show catchment areas, contour (isohyetose) levels, the site of reservoir, dam, conduit, forebay, pressure pipe line, power house, &c.; in fact, every principal physical link in the proposed development; profiles of non-pressure and pressure conduits should be attached to the report, also a key plan of the whole project. Usually, where the written text of a report is lacking in sufficient detail, &c., good up-to-date maps and photographs help to fill in the gaps, they also help to give a better understanding of the written text contained in the main report. About the most useful are those showing works in full on large-scale contour maps and plans. To show a water-power report off at its best it might be necessary to attach the major part of, or the whole of the following mentioned:—

1. Plan on the scale of about 1.0 in. to the mile, showing the catchment, reservoir, dam, headworks, conduit, forebay, pipe line, power house, &c. If there are several catchment areas for the project, or combination of projects, these should be shown in different colours.

2. Plan on the scale of about 6.0 in. to the mile, showing different parts of the civil engineering works.

3. Plan on the scale of about 25.0 in. to the mile, showing the dam (in some detail).

   (*a*) Plan on the scale of about 25.0 in. to the mile, showing the headworks (in some detail).

   (*b*) Plan on the scale of about 25.0 in. to the mile, showing forebay (in some detail).

   (*c*) Plan on the scale of about 25.0 in. to the mile, showing power house and tail-race (in some detail).

4. Plan showing the areas of land to be more or less submerged.

5. Several plans indicating, by means of sections, the nature of the ground for the installation of the dam, forebay, or regulating reservoir, conduit, surge tank, pipe line, power house, tail-race, &c. The different specimens of work, &c., can be shown in different colours.

Besides the above mentioned, the photographs which should accompany a water-power report may involve:—

Views of parts of the catchment area, with a short mention of geology, &c., below each view. Aerial views would perhaps be the most useful—their use need not be considered here.

Views of the proposed reservoir site taken from different points and angles, indicating approximate water levels with lines drawn across the photograph.

Views of the proposed sites of headworks, intake, &c. The views of site of dam or headworks should be taken from up- and down-stream ends, showing banks in every case. On each photograph indicate the water levels by drawing lines across the photograph.

Views of rapids or falls taken from each side of the stream (at different elevations).

Views of the most difficult parts of the conduit route for those sections of conduit requiring siphons, aqueducts, &c.

Views of the proposed forebay site taken from different angles; indicate thereon the approximate water level.

Views of the proposed pipe-line route, more particularly the difficult parts of the route. Indicate by arrowhead location of spillway channel from the forebay and its relation with location of the pipe line. Give a concise statement below each view of the hillside conditions, &c.

Views of the proposed power-house site and tail-race, indicating high- and low-water levels by drawing lines across the photograph. Give statement below each view as to nature of ground, &c.

In addition to the above-mentioned data, &c., a report should, preferably, be accompanied by:—

(*a*) Profile of the entire conduit from the intake to the forebay.

(*b*) Profile of the entire pressure pipe line from the forebay to the power house.

(*c*) Profile of the river or stream (above and below the power reach), indicating estimated height of backwater during floods. For very low-head schemes (where a dam forms part of the hydraulic works) this information is of special importance.

At the present time it is commonly recognised that, in describing these investigations, the utmost use should be made of maps and photographs. By their use an experienced engineer can usually extract (without leaving his office) a vast amount of information as to the catchment characteristics, conditions of soil and culture, ground-water levels, possible fluctuation of ground-water levels, geology, precipitation, and run-off conditions, possible engineering difficulties, and/or excessive cost of civil engineering works, &c. Broadly speaking, maps and pictures describing a catchment cannot be too complete, although they may at first sight appear confusing. A good map would show by contour lines the configuration of the surface so that reliable distinguishing lines (indicating the boundary surrounding the topographic area under investigation) can be drawn in and the enclosed area planimetered. Tinting and other conventional methods are often used to indicate the character of the ground in different parts of the catchment. The best map would show the contour lines, the positions of rain-gauging stations and other gauging stations with the mean annual rainfall marked in for reference. A desirable map is one indicating forest-covered, bare, cultured, and other areas in the catchment under investigation. Another map (on the same scale) would show, for the same catchment, the underlying geological formations, contour levels, &c., giving the elevation of the rock surface of the different formations, &c.: these contour levels are very useful in the investigation of ground-water, water table, &c.

In conjunction with the maps and photographs mentioned above, the most useful and perhaps most sought-for information is that part of the report contained in *appendix* form, *i.e.*, *summarised statement of the main report*. One such outline or summarised statement of a water-power report is given below:—

Summarised Statement of the Report.

PHYSICAL DATA.

Location.—(Brief statement of location of sites and their respective distances from the nearest tide water, navigable river, railway station, power market, &c.)

General Information:—

River..... Falls or rapids..... Accessibility.....
Catchment area to the intake site..... sq. miles.

Water supply (brief statement):—
Local records from 18..... to 19.....show that—
Minimum daily flow is .....cusecs.
Minimum monthly flow is.....cusecs.
Average annual (low year) flow is..... cusecs.
Estimated available flow with storage.....cusecs.
Estimated annual rainfall from records..... inches.
Storage available.....acre ft..... sq. miles.
Area of storage surface.....acres.
Gross head.....ft.
Net head ..... ft.
Possible power at the turbine (assuming ...% overall efficiency).....b.h.p.
Power available for ordinary minimum flow.....h.p.
" " " estimated max. development.....h.p.
Dependable 24 hr. power with storage.....h.p.
Output generated.....kWh.
" delivered.....kWh.

Estimate of Cost Complete.

A. Preliminary work:—
1. Surveys .....£
2. Clearing sites.....£
3. Roads, bridges, railroad, &c.....£
.....£.....

B. Storage reservoirs. (Brief statement giving name, location area, available capacity for each of):—
1. "*a*" reservoir.....
2. "*b*" reservoir.....
.....£.....

C. Dam. (Brief statement of length on the crest, height, type foundations, &c.):—
1. Estimated total cost... .....£.....
a. Cost per billion cubic ft.....£
b. Cost per acre ft.....£

C_a. Weir .....£.....

D. Conduit:—
1. Surveys and clearing route.....£
2. Estimated cost for tunnels .....£
a. Estimated cost for open-cut (lined) .....£.....

E. Forebay. (Statement of approximate area: cubic contents of masonry or concrete required) .....£.....

E_a. Surge tank .....£.....

F. Pipe line. (Statement of number, sizes, lengths, thicknesses, &c.) .....£.....

G. Power house. (Substructure) for.....units:—
1. Taking care of water, *i.e.*, coffer dam, filling, face-planking, pumps and pumping, removal of .....cub. yd. of earth, &c..... £
2. Excavation of rock (.....cub. yd.) .....£
3. Concrete .....cub. yd. at ...per cub. yd...£
4. Steel .....lb. at..... per lb. .....£.....£.....

H. Power house substructure.....cub. ft. at.....£.....

I. Power-house plant:—
1. Hydraulic plant (complete) .....£
2. Electrical plant (complete) .....£
3. Miscellaneous .....£.....£.....

J. Plant and tools .....£.....

K. Tail race .....cub. yd. at ..... per cub. yd. .....£.....

L. Right-of-way, &c.:—
1. Reservoirs and flowage.....£
2. Waterways.....£
3. Concessions and land .....£
4. Power transmission .....£.....£.....

M. Transmission lines: Telephone lines .....£.....

M_a Sub-stations: Transformers, phase compensators, &c.....£.....

N. Permanent dwelling houses, &c.....£.....

O. General: Legal: Parliamentary Bill .....£.....

P. Engineering .....£.....

Q. Contingencies .....£.....

R. Working capital .....£.....

S. Interest during construction .....£.....

Total £

Per cent. value and unit cost in terms of *total net developed h.p.*:—

Unit.	£ per h.p.	Per cent.
		%
A	£.....	.....
B	£.....	.....
C	£.....	.....
.....	.....	.....
.....	.....	.....
Q	£.....	.....
R	£.....	.....
S	£.....	.....
Total cost per h.p., £.....		100%

1. Operating expenses :—
   Superintendent .....£
   Operators.....£
   Assistants .....£
   Labour.....£
   .....£.....
2. Supplies .....£.....
3. Maintenance* and repairs, &c., of
   a. Dam, tunnels, open conduit, forebay, &c....£
   b. Storage reservoirs.....£
   c. Power-house and plant .....£
   d. Transmission and telephone systems.....£
   e. Sub-station and equipment, &c.....£..... £.....
4. Depreciation :—*
   a. Dam at .....% on £.....£
   b. Tunnels at.....% on £.....£
   c. Conduit at.....% on £.....£
   d. Forebay at.....% on £.....£
   e. Pipe line at .....% on £.....£
   f. Power-house substructure at.....% on £.....£
   g. „ plant at .....% on £.....£
   h. Transmission line (copper, insulators, towers, &c.) at.....% *respectively*.....£
   i. Transformers, &c., at.....% on £ .....£
   j. Telephone system at .....% on £ .....£ .....£.....
5. Taxes, Insurance, &c. :—
   a. Government water-power tax.....£
   b. Land tax.....£
   c. Income tax.....£
   f. Insurance .....£ .....£.....
6. Administration and general .....£.....

Total £

Interest at .....% on total investment .....£
Yearly cost of operation and fixed charges .....£

Unit cost of power :—
1. Cost per e.h.p. at the switchboard for total.....e.h.p. is £.....
2. Cost per e.h.p. delivered at.....for total.....e.h.p. is £.....
3. Cost per kWh delivered at.....for total.....kWh is .....(pence).
4. Cost per kWh delivered (assuming a load factor of
   a. Do. do. do. 25%.....(pence).
   b. Do. do. do. 35%.....(pence).
   c. Do. do. do. 50%.....(pence).
   70%.....(pence).

* Allowance for *maintenance and depreciation* may be taken roughly at :—Dam and gates (·5—1·5%) ; conduit and appurtenant works (3—6%) ; pipe line (2—3%) ; buildings (1·0—2·5%) ; turbines and governors (3 — 7%) ; generators and exciters (3 — 6%) ; transformers (3—6%) ; switchgear (2—6%) ; *overhead transmission lines* : insulators (8—10%), conductor (4—9%), steel towers (3—5%), wooden poles (6—10%), cross arms (3—5%).

THE "LOPULCO" PULVERISED FUEL SYSTEM.

The "Lopulco" system of employing pulverised fuel in boiler installations has been adopted in a number of large power stations and industrial works in the United States, and it has now been introduced into the European Continent by the Underfeed Stoker Co., Ltd.

The plant which is being installed at the Usine de Vitry, belonging to the Union d'Electricité of Paris, is a typical example of the system, and it will be the largest and most important development in the use of pulverised coal for power generation in Europe.

The initial installation will consist of four Delaunay-Belleville boilers, each having a heating surface of 16,678 sq. ft., and an evaporative capacity of 140,580 lb. of water from and at 212 deg. F. normal; and 210,870 lb. from and at 212 deg. F. maximum. The maximum duty is to be maintained for four hours. Each boiler will be complete with superheater and an economiser, with a heating surface of 9,684 sq. ft. The normal coal consumption will be 12,800 lb. per hour, and the maximum consumption 19,700 lb. per hour with coal of a calorific value of 12,600 B.th.u. per lb.

The "Lopulco" equipment will consist of four pulverisers with a capacity of 6 tons per hour; four "Usco" waste-heat gravity driers for reducing the moisture content of the coal on its way to the pulverisers; four exhausters to effect the removal of the finished product by air separation, and to deliver it to the pulverised coal bunker; twenty duplex "Lopulco" feeders with fans for delivering, with air, a regular pre-determined quantity of coal to the burners; and forty "Lopulco" burners (ten per boiler).

The combustion chambers are shown in the accompanying illustration (fig. 1). They are fitted with water screens consisting of pipes connected to the boiler in such a way as to ensure a rapid circulation of water through them. These tubes form part of the heating surface of the boiler, and being exposed to the direct radiant heat of the furnace, add materially to the effective heating surface. The screen ensures that the temperature of the chamber below the screen is lower than the fusing temperature of the ash, so that under all conditions of operation the ash is deposited in the form of dust which will readily discharge into trucks beneath the ash hopper. Without the water screen there is a choice of two methods. One is to have the combustion chamber so large that the lower portion will be sufficiently cool to prevent the ash from fusing; the other is to rely upon the surface temperature being sufficiently high to fuse all the ash so that it can be continuously discharged in a fluid condition. It is found with the latter system that if the furnace temperature is a

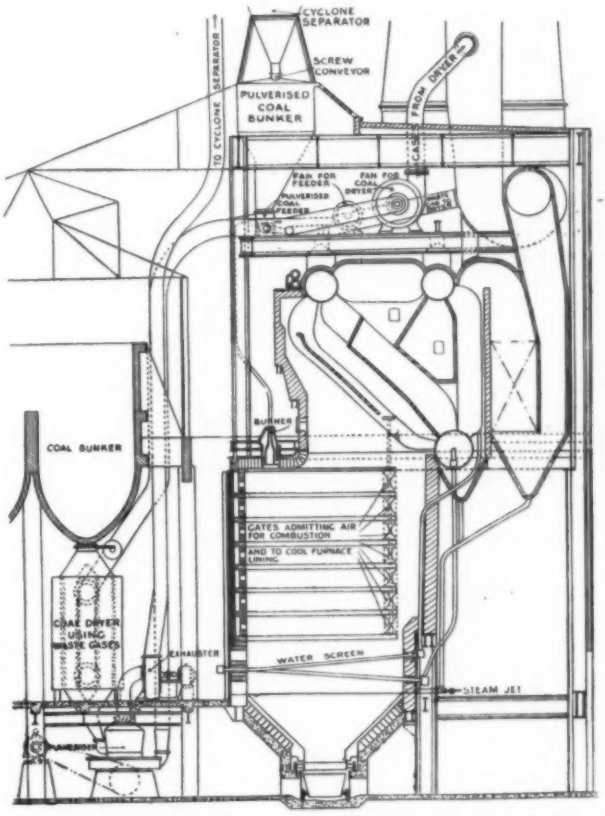


FIG. 1.—THE "LOPULCO" PULVERISED FUEL SYSTEM AT THE VITRY STATION OF THE UNION D'ELECTRICITÉ.

little too high the fused ash will rapidly destroy the furnace lining. If the output be reduced below a certain critical point all the ash will not fuse, it will build up in sticky masses at the bottom of the furnace and ultimately choke the outlet, necessitating the shutting-down of the plant. With the use of the water screen, these difficulties are said to be avoided. A high rate of combustion can be maintained per cubic foot of combustion space, and still allow the ash to collect in the form of dust, while the furnace can also be operated at a low rate without in any way affecting the condition in which the ash is deposited. Secondary air for combustion is admitted through ports in the front wall of the furnace, but these ports are connected through the hollow furnace walls to air admission doors, which are remotely placed to allow the air to cool the furnace walls and be heated before entering the furnace.

The energy consumed by the "Lopulco" system for the preparation of the coal and its delivery to the burners, including pulverising, air separating, drying, and conveying, is expected not to exceed 19.5 kWh per ton of coal burned.

Italian Lignite as Fuel.—The use of native lignite as fuel in generating stations is now to be taken in hand in Italy with the financial support of the Government. Thus the Società Miniere di Lignite, which is to construct a generating station of 15,000 kW at Bastardo, near Giano dell'Umbria, has been promised State aid at the annual rate of 130 lire per kW installed for a period of 20 years, provided that the installation is completed by the end of 1924 at the latest. Similar works are projected near Ruscio (Perugia), Pietrafitta (Perugia), Torre del Lago (Lucca), and in Branca (Udine).

CUSTOMS TARIFFS.

(1) Empire Markets.

In its desire to draw the attention of exporters of electrical and allied machinery and apparatus to all matters that might aid them in developing their overseas trade, the Electrical Review made a practice before the war of publishing as complete information as possible regarding the import duties levied in the British Dominions and Colonies, and foreign countries.

So numerous and so rapid have been the changes in the Customs tariffs of many countries in recent years that it has been scarcely practicable to devote the necessary space to recording them. In the more important Empire markets some degree of finality appears now to have been reached. In others the position is such that it may also be usefully reviewed. It is therefore proposed to publish, in respect of the more important markets for British machinery, a general statement of the import duties on electrical machinery and apparatus. This week, India, Australia, New Zealand, and South Africa are dealt with.

India.

In order to assist Indian manufacturing enterprise, machinery may be imported at the reduced rate of 2½ per cent. *ad valorem*, instead of 15 per cent. *a.v.*, which is the general tariff. This concession covers apparatus and appliances designed for use in an "industrial system" as parts indispensable for its operation, which have been given for that purpose some special shape or quality which would not be essential for their use for any other purpose.

The term "industrial system" means an installation designed to be employed directly in the performance of any process necessary for the manufacture, production, or extraction of any commodity. Component parts of machinery will be held to be those which are essential to its operation. At the same time, on machinery and component parts thereof to be worked by manual or animal labour, not otherwise specified, 15 per cent. *a.v.* is levied.

Included in the 2½ per cent. schedule are prime movers; machines and sets of machines to be worked by electric, steam, water, fire, or other power; control gear and transmission gear, including belting, for use with the foregoing; but 15 per cent. has to be paid on electrical control gear and transmission gear—namely, switches, fuses, and circuit-breaking devices of all sorts and descriptions, designed for use in circuits of less than ten amperes, and at a pressure not exceeding 250 volts, and regulators for use with motors designed to consume less than 187 watts; bare or insulated copper wire and cables, any one core of which has a sectional area of less than one-eightieth part of a square inch, and wires and cables of not more than equivalent conductance; and line insulators, including also cleats, connectors, leading-in tubes, and the like, of types and sizes such as are ordinarily used in connection with the transmission of power for other than industrial purposes, and the fittings thereof.

Australia.

In Australia, in accordance with the Commonwealth's progressive policy of encouraging and protecting home manufacture, import duties are considerably higher than in India. The following table shows the more important items:—

	General Tariff. Per cent.	Preferential Tariff. Per cent.
Electroliers ... ... *ad valorem*	45	35
Filament lamps for lighting or heating, per lb.	3s.	1s.
Arc lamps	15	Free
Switches, fuses, and lightning arresters *a. v.*	40	27½
Regulating, starting, and controlling apparatus, including distributing boards and switchboards ... ... *a. v.*	40	27½
Dynamo-electric machines, static transformers, and induction coils, electric fans ... ... *a. v.*	40	27½
Carbon manufactures, including blocks *a. v.*	45	30
Electric heating and cooking appliances *a. v.*	40	27½
Telephones, telephone switchboards, telephone distributing boards and appliances ... ... *a. v.*	10	Free
Cable and wire, cotton covered *a. v.*	40	25
Cables, telegraph and telephone, paper insulated, lead covered ... ... *a. v.*	45	30
Covered cable and wire, n.e.i. ... *a. v.*	15	Free
Electric vacuum tubes ... ... *a. v.*	15	Free
Watt-hour meters, a.c. ... ... *a. v.*	45	35
Other measuring and recording instruments ... ... *a. v.*	15	Free
Motive power machinery and appliances (except electric), *viz.*:—		
(*a*) Flue-heated economisers, steam traps ... ... *a. v.*	10	Free
(*b*) Corrugated cylinders for boilers *a. v.*	10	Free
(*c*) N.e.i. ... ... *a. v.*	40	27½

It should be noted, however, that a number of articles may be imported into the Commonwealth free of duty if they are for use in connection with the manufacture of electrical apparatus. These articles include:—

Empire cloth.
Insulating paper and board, oiled silk, electrical sheets (under security).
Resistance wire.
Bayonet-type caps for adaptors.
Dry red lead for batteries (under security).
Dry cell parts.
Nichrome wire.
Magnets for magnetos.
Electrical equipments for locally-made tramway cars.
Rotors, stator winding and insulation for turbo-alternators.

New Zealand.

New Zealand, it will be seen from the following statement, admits nearly all British electrical material free of duty, whilst on such goods from other countries 10 per cent. *a. v.* is levied. It may be added that where 10 per cent. is charged on British goods, 20 per cent. is, as a rule, the rate under the general tariff.

New Zealand Import Duties.

	British Preferential Tariff. Column No. 1.
Boilers, land and marine; feed-water heaters; fuel economisers, n.e.i.; steam superheaters	20 per cent. *ad val.*
Fuel economisers, entered and declared for mining purposes	Free
Gas engines and oil engines, n.e.i.:—	
Not exceeding 100 b.h.p.	15 per cent. *ad val.*
Exceeding 100 b.h.p.	Free
Reversing gears for gas and oil engines, n.e.i.	15 per cent. *ad val.*
Steam engines:—	
(1) Stationary, not exceeding 200 b.h.p.	10 per cent. *ad val.*
(2) Stationary, exceeding 200 b.h.p.	Free
(3) Marine, not exceeding 400 b.h.p.	10 per cent. *ad val.*
(4) Marine, exceeding 400 b.h.p. ...	Free
(5) N.e.i.	10 per cent. *ad. val.*
Steam turbines, water turbines, and Pelton wheels:—	
(1) Not exceeding 200 b.h.p.	10 per cent. *ad val.*
(2) Exceeding 200 b.h.p.	Free
Engine governors	Free
Incandescent-filament electric lamp bulbs, not being peculiar to surgical use, and having, at the marked voltage, a power consumption—	
Not exceeding 2 watts	1d. per bulb
Exceeding 2 watts and not exceeding 70 watts	3d. per bulb
Exceeding 70 watts and not exceed 150 watts	6d. per bulb
Exceeding 150 watts—	
For the first 150 watts	6d. per bulb
For each additional 100 watts or fraction thereof	3d. per bulb
(*Note.*—The marked voltage of a lamp bulb shall be taken as that at which the bulb operates at highest efficiency, and not necessarily as that which is indicated by the manufacturer.)	
Electric lamps, n.e.i., not being peculiar to surgical use	10 per cent. *ad val.*

	British Preferential Tariff. Column No. 1.
Machinery or appliances peculiar to the generation of electricity, to the transformation of pressures of electric currents, or to the conversion of one type of electric current to another; electric motors, and starters or controllers therefor; slide rails for electric generators or electric motors; shunt or voltage regulators; switchboards, fuse-boards, and distribution boards or boxes for electric circuits; electric furnaces for chemical purposes, or for the treatment of metals; carbons or electrodes for arc lamps, or for electric welding; electrical appliances peculiar to electro-plating, electrolysis, electro-metallurgy, telephony, telegraphy, surgery, or to the production of ozone; X-ray tubes and electrical vacuum tubes not suitable for purposes of illumination; trolley poles or collectors for electric tramcars or electric locomotives; frogs, crossings, and line-cars for overhead conductors for electric railways or tramways; lightning arresters for the protection of electrical apparatus; the following electrical appliances, *viz.*:—Rheostats and resistances, n.e.i., including reactance or choking coils for the reduction or control of electric currents, condensers, relays, electro-magnets, switches, wall plugs, and shoes or sockets therefor, circuit breakers, circuit makers, fuses, wire or cable connectors, and terminals; and the following materials, *viz.*:—Insulated cable and wire, carbon in block, sheet, or rod, mica, vulcanite, insulating tape, and other insulating materials, n.e.i., not including insulating piping or tubing, nor insulating fittings for pipes	Free
Electric appliances, n.e.i., including cooking appliances, radiators, and similar heating appliances, electric sirens, electric bells or buzzers, and annunciators or indicators therefor, bell-pushes, door and similar contacts, and insulators ...	20 per cent. *ad val.*
Welded and flanged boiler furnaces, plain or corrugated; expansion rings, furnace flues, and unflanged end plates for boilers	Free

South Africa.

In the South African Customs tariff, nearly all electrical machinery, apparatus, and accessories are imported free of duty under the British preferential arrangement, the general rate being 3 per cent. The rates on certain exceptions, *viz.*, electroliers, electric torches, and hand lamps are 17 per cent. (British) and 20 per cent. (general).

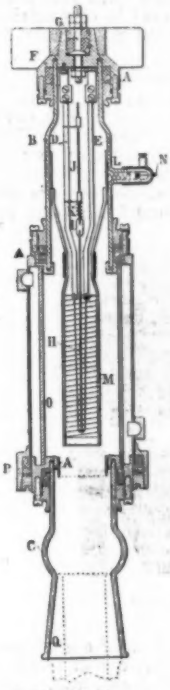
A HIGH-POWER WIRELESS VALVE CAPABLE OF BEING DISMANTLED.

At a recent meeting of the Académie des Sciences, M. G. Ferrié presented a note in which M. Holweck described a wireless valve capable of being dismantled easily for repairs. In the construction of any thermionic apparatus—valve, X-ray tube, or triode—which is to be evacuated once for all, one is compelled to use materials which can be heated without decomposition and have no appreciable vapour pressure. Such materials are glass, quartz, and metals. The different parts of the apparatus are welded together, and dismantling is difficult. Breakage of a filament, fusion of a support, or deterioration of vacuum due to heavy overload may result in total loss of equipment which, in large sizes, is costly; any attempt to repair valves of the glass-bulb type is said to be troublesome and expensive.

To overcome these risks and difficulties, the apparatus may be built up from insulating and metallic components which are connected by detachable joints. The anode is water-cooled, and a pump runs continuously to maintain the requisite vacuum. Naturally this solution is applicable only to high-power valves, but, for such, it appears to offer considerable advantages. The accompanying figure, reproduced from *Le Génie Civil*, shows a section through a 10-kW triode valve of the type actually in service at the Eiffel Tower.

The joints are made by rubber rings A, free from volatile matter and excess sulphur. These rings are placed round glass pieces B, C, above the base of the tubes, and are compressed by flanges which form stuffing boxes. The joint thus formed is tight yet easily opened, and the plastic substance has only a very small area exposed to the vacuum space.

The filament is carried by nickel rods D, E, which are fixed in the metallic piece F. An insulated electrode G serves to lead current to the rod E, and the other rod D is connected to the frame. A molybdenum rod, in two insulated portions JH, separated by a spring K, maintains suitable tension in the filament. Radiator fins on the head piece increase the cooling surface.



A 10-kW Valve.

The molybdenum grid M is carried by a split ring L, which fits inside the tube B. An electrode N, sealed through the glass tube, makes electrical connection with the grid. The "plate" is constituted by a copper tube O which is cooled by water circulating between it and an outer tube. The elastic joint at P allows for differences in expansion between the two tubes. A thermometer (not shown) measures the temperature of the outflowing water, and thus makes possible determination of the efficiency.

The base of the tube C rests on the ground cone Q of a helical molecular pump.

In the particular valve which has been in continuous service for radio-telephony at the Eiffel Tower since May 23rd last, the filament consists of 36 cm. of tungsten, 0.05 cm. diameter, mounted as two halves electrically in parallel. The heating current is 36 amps., the filament temperature 2,700 deg. C. absolute, and the saturation current about 6 amps. The grid is a helix 1.8 cm. in diameter, of 0.3 cm. pitch, made of molybdenum wire 0.04 cm. in diameter. The plate is 4.5 cm. in diameter and 11 cm. long.

With a plate potential of 5,000 V, the power delivered to the aerial of the Eiffel Tower is 8 kW (35 A), and with 4,000 V on the plate the power in the aerial is 5.8 kW (30 A). The efficiency is of the order of 80 per cent. The triode can be put into operation and the pump started in about 30 seconds. The power emitted from the trial installation with good modulation is from 5 to 6 kW.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

A New Type of Seal.

Many forms of seal which are used to prevent tampering with electricity meters and similar apparatus are susceptible to interference and reinstatement, and therefore fail to achieve their object. The Decorated Metal Manufacturing Co., of New York, has patented a sealing device which cannot be opened without being totally destroyed. This consists of a soft metal strip bearing three pressed studs. The centre one is a "male" stud, and is slotted for the reception of a sealing wire. Over this is placed a "female" stud, which locks the wire in position, and over this again is inserted a third stud, the whole being crushed together with a flat-jawed tool. This results in the shoulders of the slotted male stud being crushed inwards, firmly holding the wire, and locking inside the outer studs, thus offering triple protection against the removal of the wire. A variation of the seal has a hole instead of the first female stud. To prevent the substitution of a similar seal for one that has been destroyed, the soft metal strip can be stamped with a special device by the firm or authority employing it.

Lock for H.O.-type Lampholders.

— The "Complete" lamp-lock, made by Mr. J. A. Brook, 84, Blackmoorfoot Road, Huddersfield, which has been on the market for some time, has now been altered somewhat for application to the "Home Office" type of lampholder. It is claimed to be the only lock for this type of holder so far. The way in which the socket is fitted into the insulation of the holder makes the provision of an efficient lock a matter of some difficulty. The arrangement adopted is not quite the same as the original method. In the latter two rings form the lock. One of these is screwed on to the holder and is clamped down on a second ring in which are two notches fitting over the projecting ends of the pins of the lamp, preventing them from being moved upwards and sideways to

remove the lamp. The screwed ring is tightened by a special key.

In the adaptation to the Home Office holder there is a ring with two projections corresponding with the slots in the lamp socket. Over this a tightening ring is screwed by means of an insulated key. In use the rings are placed over the lamp with the projections on the inner ring just beneath the lamp pins. Thus, when the lamp is inserted in the socket the projections follow the pins, but when the latter have been turned in the slots the inner ring is forced down on to the shoulder of the lamp by the screwing up of the outer ring, preventing any movement of the lamp. The arrangement is very efficient as the key is of a form not easily duplicated in ordinary circumstances.

The "Memak" Switch.

The Midland Electric Manufacturing Co., Ltd., Barford, Street, Birmingham, has introduced a new range of ironclad switchgear under the trade name of "Memak." These switches are of the quick-make and quick-break type, but are of lighter construction than previous designs, so that in addition to their use on industrial installations they are particularly suitable for house-service work, and for heating and

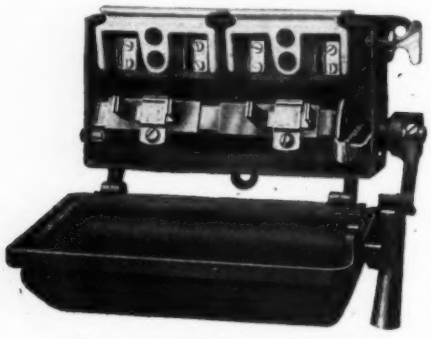


Fig. 1.—A "Memak" Switch.

cooking apparatus where a "foolproof" switch of neat appearance is required. The cases of the switches, one of which is illustrated in fig. 1, are of black enamelled cast-iron. The switch movement comprises hard-drawn copper blades mounted on an insulated steel bar. The contacts are of extruded brass with side pressure wings, each pole being mounted on a separate porcelain base.

Owing to the simplicity of their design and standardised methods of production, the switches are very low in cost.

An Electrically-operated Scaling Hammer.

A demonstration was given recently at the works of the Mercantile Dry Dock Co., Jarrow-on-Tyne, of Wright's mechanical scaling appliance. The machine, which is a new departure, is composed of a malleable steel casing, enclosed in which is a revolving six-bladed solid hammer manufactured in hardened Sheffield steel, mounted on special dust-proof ball bearings, working in guides cut in the sides of the casing and loaded with suitable springs, which absorb the shock while the tool is in operation. The hammer is adjustable to the work in hand. The tool is operated through a flexible steel shaft working in an armoured casing by a ¼-h.p. electric motor running at the rate of 2,000 r.p.m. The control switch is mounted on the casing of the tool, and can be switched on or off by the thumb. The machine is adapted to work from the usual lamp circuits. The weight of the tool is 6¼ lb., and a special circular brush, interchangeable with the hammer, is supplied. All parts are immediately accessible and interchangeable by the operator, no mechanical knowledge being necessary. It can be supplied for any voltage and standardised spare parts are by no means costly. A particular feature is that the scale is efficiently removed without even marking the plates.

On actual test the machine scaled a square yard in ten minutes, and an even more severe test was that of scaling a similar space, on which there were no fewer than fourteen coats of paint, in fifteen minutes. Rust scale can be removed very rapidly, in fact almost as fast as the tool can be moved over the plates. It is being adapted for all classes of scaling in all forms, and particularly boiler scaling. The inventor claims that scaling costs can be reduced at least 40 per cent. by the use of this machine. The equipment is packed in a strong wooden box, and the total weight, including spares, is only 70 lb.—*Journal of Commerce.*

Re-appointment of Durban Correspondent.—The *Board of Trade Journal* announces that the post of Imperial Trade Correspondent at Durban, which was one of those closed as from April 1st, 1922, has been re-established. The Correspondent is Mr. D. Strachan, P.O. Box 1858 Durban, South Africa.

CORRESPONDENCE.

Letters received by us **after 5 p.m. on Tuesday** *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Water Power at Barnaline.

The writer has studied with much interest the efficiency curves given in fig. 5 on page 252 of your current issue. His attention was drawn to the curves by the extraordinarily high figures claimed at full and part gate, which he had not believed possible.

A study of the curves shows that they are quite unreliable and entirely misleading. For instance, take the full-load results shown:—

B.H.P. of turbine	= 55.5
Theoretical h.p. in water	= 73.0

This actually means an efficiency of 76 per cent. But the efficiency curve is drawn to show 84 per cent. (an error of over 10 per cent.). Again, take the results at 300 cubic feet per minute:—

B.H.P. of turbine	= 26.0
Theoretical h.p. in water	= 41.0

An actual efficiency of 63.4 per cent. The efficiency claimed in the curve is 76 per cent. (an error of nearly 20 per cent.).

Again, regarding the figures from another point of view, and estimating the efficiency on a basis of losses, we find the following shown:—

No-load quantity = 123 cubic feet per minute.
Full-load quantity = 540 cubic feet per minute.

From which the efficiency may be deduced as follows:—

(Input—losses)/Input = (540—123)/540 = 77.3 per cent.
(Instead of 84 per cent. as claimed).

This assumes that the whole difference between full- and no-load quantities is used at 100 per cent. hydraulic efficiency (an inconceivable result), which is evidently not the case, as the difference between theoretical h.p. and b.h.p. is shown by the curves to be greater at full load than at no load.

The writer's long experience in water-power has led him to believe that tests at maker's works should be accepted with reserve and the foregoing remarks show that one cannot hope to make a water turbine into "a fairly reliable water meter," at any rate, by such tests as those described in your article.

Eric Crewdson, Assoc.M.Inst.C.E.

Kendal, *August 20th*, 1923.

We are indebted to the Editors of the Electrical Review for the opportunity of replying to the criticisms contained in Mr. Eric Crewdson's letter, dated August 20th, of the efficiency curves published on page 252 of the current issue of the Electrical Review, showing results obtained from tests of one of our water turbines. There is an obvious mistake in the curves shown on the diagram which has passed unnoticed by Mr. Crewdson, and which has the effect when corrected of answering satisfactorily most of the points he raises. The theoretical h.p. curve shown on the diagram has unfortunately been placed in the wrong position, as it shows a theoretical power of 82 b.h.p. with 600 cubic feet of water per minute under a fall of 64 ft. 6 in., equal to an efficiency of 112 per cent. The correct point through which this curve should have been drawn with 600 cubic feet of water per minute is 73 b.h.p. This, coupled with the fact that the lower portion of the "B.H.P. turbine" and the "K.W. generator" curves are both slightly low on the diagram published, corrects the errors pointed out and makes the efficiency curves shown correct. If Mr. Crewdson had taken the trouble to check the theoretical curve, as he has apparently done all the others, the mistake would have been obvious. With regard to his remarks on the estimated efficiency based on the no-load quantity of water of the turbine, we should like to point out that the no-load quantity shown on the diagram does not represent the correct no-load consumption of the turbine itself, as at this point the turbine was driving the shaft extension, flywheel, and generator, all running at 1,000 r.p.m., and a small oil pressure governor in addition.

Hay, Maryon & Co., Ltd.
J. F. Maryon, *Director.*

C.T.S. Wiring in Workshops.

I have only just seen the letter of "W. B. V." in your issue of July 27th, as I have been endeavouring to forget electrical matters by the seashore. "W. B. V." seems to have rather misread my letter—I was speaking from the supply engineer's point of view, and would point out that the Editor of the Electrical Review is never tired of drawing our attention to the fact that there is no legal authority for enforcing wiring rules.

Most responsible contractors, however, have now come to the conclusion that a reasonable enforcement of wiring rules is to their advantage. I agree that it would be better for all

concerned if all supply engineers could enforce the rules of the Institution of Electrical Engineers, so that we could have a common basis. We are continually being told, however, of ridiculous rules made by supply authorities, but I am very anxious to know from whom these rules emanate.

I, personally, have been connected with four supply undertakings in this country, and none of these ridiculous rules were made by them. It would be an advantage, therefore, if "W. B. V." would give the name of the supply authority which insists upon a certain size of screw, for instance. I believe another supply authority insists upon a definite type of fuse being used, cutting out all other makes. This, in my opinion, is wrong, and the supply engineers should certainly not allow individual eccentricities to control the work of a contractor, provided he completes a reasonable job and generally conforms with the standard rules, such as those of the I.E.E.

Such discussion as this is useless, however, unless we get down to something practical. It seems to me that the only practical way is to let it be known definitely who the supply authorities are who insist upon certain peculiarities, such as those suggested by "W. B. V." I agree that contractors are in a very awkward and difficult position, especially the smaller contractors, as they are largely in the hands of the supply engineer, who may be a pugnacious individual who will insist upon his word being law, whereas, as pointed out repeatedly by the Electrical Review, he has not a leg to stand on when it comes to specifying any particular apparatus or wiring.

W. E. Bradshaw, A.M.I.E.E.

London, *August 20th*, 1923.

Statutory Notices.

I have read with interest your leaderette under the above heading in your issue of August 17th, and am very pleased to note that, with your usual sound judgment, you are directing the light of reasonableness on to an irksome question. Your suggestions are good, but I think they do not go far enough.

Notices will be of very little use to the Post Office unless definite dates for the carrying out of the work are stated, but, as you indicate, it is extremely unlikely that every service will be inspected by the Post Office, and the Post Office officials themselves must surely agree with you that it is not necessary.

The lives of central station engineers are already busy enough without the imposition of any additional unnecessary obligations. As regards local authority notices, it should be borne in mind that the attitude in most cases of the surveyor to the local supply authorities is a reasonable and helpful one, and that provided notices are served in respect of each service, strict attention to dates is not always insisted on, and for this reason notices to the Post Office in which the exact date is called for will undoubtedly entail time and trouble and become, as you indicate, a most particularly irksome duty. I would, therefore, put forward the following definite suggestion:—

That the Post Office waive their request for a notice in respect of each service, and instead, adopt the practice of leaving it to their local representatives to request on, say, one or even two occasions during the year, submission over a period of a week of notices of services to be carried out.

I suggest that this would enable the Post Office officials to assure themselves of the standard practice of any particular undertakers being in accordance with the Post Office requirements, and these inspections would of themselves tend to educate the staff of the electric supply undertaking in conforming to Post Office requirements if they had been liable to deviate at all from them. For the rest, the Post Office inspector could make snap inspections at any time he happened to pass a service which was being laid. The matter being left to the local representative would enable him to choose a week when his own work was such as would be likely to allow him to give adequate attention to the inspections.

I sincerely trust that those in authority in the Post Office may give due consideration to this suggestion, which, they themselves will be able to believe, probably interprets correctly the feeling of practically all supply engineers. I can, at any rate, assure them that it is so in the case of every supply engineer with whom I have discussed the question.

C. F. Mounsdon,

Resident Manager and Engineer to the Sevenoaks and District Electricity Co., Ltd.

Sevenoaks, *August 21st*, 1923.

Strike at Helsby.—On August 20th, about a thousand employés in the cable-making department of the works of the British Insulated & Helsby Cables, Ltd., ceased work as a protest against the employment of four men who were not members of a trade union.

On the following day the non-unionists agreed to join the trade union and the strike ended.

TURBO-GENERATOR DESIGN.

Dr. Robert Pohl, chief electrical engineer, A.E.G. Turbine Works, Berlin, discusses in the *Electrical World* the respects in which the German design of large turbo-generators differs from that adopted in America. Constant stresses and self-ventilation are the main features, while the coil, teeth and rotor design are unusual. The author points out that the two 60,000-kVA sets at the Goldenberg works near Cologne, put into operation in 1919, are still the world's largest sets of their kind in actual operation, though generators of similar output at 60 cycles are in course of construction in the United States.

Of the two alternators originally installed at the Goldenberg works, only one was manufactured by the A.E.G., the other at the Siemens-Schuckert works. The main features of the latter, especially those of its rotor, are somewhat similar to American designs. The six-pole rotor, weighing about 100 tons, consists of steel disks of 2.25 m. diameter shrunk upon a solid forging of about 1.1 m. diameter. The rotor slots are milled into the disks to receive the winding, which is laid down turn by turn, and the coil ends are held by bells of alloy steel. The total weight of the alternator is about 250 tons (4.2 kg. per kVA).

The A.E.G. alternator, though its weight and dimensions are very similar, is made after a different design, and two other machines now in course of manufacture are improved only in details. Their output at 70 per cent. power-factor will be 6,600 volts, 5,250 amp., 60,000 kVA, 50 cycles, 1,000 r.p.m., with a range of voltage variation between 6,000 and 7,000. At a higher power factor and 7,000 volts, each generator has a capacity of 65,000 kVA. This capacity might have been obtained with a four-pole design; that is to say, with a working speed of 1,500 r.p.m., whereby a considerable economy in weight and dimensions might have been obtained, but because of the experience already gained with the six-pole design, as well as for reasons of interchangeability, it was decided to adhere to it.

The design differs in important respects from familiar practice, more particularly with regard to the rotor. The principle is to produce during the building up of the rotor and its windings stresses in all its parts so great as to exceed the stresses set up later on by centrifugal force even during the overspeed trial. There is thus no possibility of changing the balance, and the need for rebalancing on the site no longer occurs. Moreover, the mechanical factor of safety attainable with this design is so high that an overspeed test of from 35 to 50 per cent. above normal speed, instead of the usual 15 or 20 per cent., can be resorted to. The rotor coils are wound completely on a winding machine, baked at a temperature of 180 deg. C., and pressed to exact shape at about three times the running pressure. They are then hard and almost like solid copper. The magnetic section of the rotor consists in principle of a solid core with dovetails around its circumference, into which packets of tooth punchings are threaded after assembly of the rotor coils. The packets are each riveted together and separated from one another by the projecting rivet heads. The vent ducts so created, together with the air grooves in the core and the air spaces alongside the coils in the slots, form an elaborate system of axial and radial ventilation. Heavy bronze wedges at the top of each slot, sliding upon a slightly wedge-shaped liner, finally secure all parts.

The rotor end windings are not allowed, under the influence of centrifugal force, to lie against the solid end bells, as is the case in most other designs. To create the desired constant stresses, the coil ends are pressed down upon a solid support by steel wire bands, and they are wound on under such a predetermined tension as to ensure the desired result. The rotors of the new 65,000-kVA alternators differ in design from the foregoing description only because the core consists not of one solid forging as depicted, but had to be divided into an inner solid forging and a number of steel disks shrunk upon the former. The steel disks are dovetailed around their circumference to receive the teeth. Fans at either end supply the whole of the cooling air required. Self-ventilation, despite its somewhat lower efficiency, has in practice proved preferable to a separate low-speed fan such as was used for one of the first two 60,000-kVA generators at the Goldenberg works.

The stator design, as far as ventilation is concerned, corresponds to the usual plan of numerous radial ducts supplied with air both from the inner periphery—*i.e.*, from the rotor— and from the outer periphery. Axial channels in the stator frame above the stampings lead the air to the radial ducts and thus ensure practically uniform cooling over the whole length of the active material. However, the stator winding is of the single-bar type, not of the double-layer type customary in America. That is to say, there is only one laminated bar per slot. Hence a thermocouple can be placed only at the side of the bar, not between two bars. The end connections are of involute shape and braced so that reactors for limiting the initial short-circuit current may be dispensed with. The value of the latter does not exceed fifteen times the normal current, while the steady short-circuit current is only one and seven-tenths times the normal.

NEW PATENTS APPLIED FOR, 1923.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. Sefton-Jones, O'Dell and Stephens, Patent Agents, 285, High Holborn, London, W.C.1.

20,068. "Impregnation of fibres by electrolysis." H. Cruse. August 7th.
20,073. "Variable electric condensers." Economic Car Light, Ltd., and W. W. Lewis. August 7th.
20,094. "Electric plug." H. J. Billingsley. August 7th.
20,099. "Air-brake dynamometers." Armstrong Siddeley Motors, Ltd., B. W. Shilson, and F. R. Smith. August 7th.
20,100. "Air-brake dynamometers." Armstrong Siddeley Motors, Ltd., B. W. Shilson, and F. R. Smith. August 7th.
20,106. "Telephone mouthpieces." F. L. van Houte and J. van Stuyvenberg. August 7th.
20,107. "Inductance coils for wireless telegraphy, &c." A. Ford-Lloyd. August 7th.
20,112. "Receiving apparatus for wireless communication." A. J. Bull. August 7th.
20,116. "Thermionic valves." W. A. Laming. August 7th.
20,123. "Electric arc welding." Handstock, Ltd., A. E. McCarthy, H. Martin, and L. J. Steele. August 7th.
20,129. "Filament suppliers." Kanegafuchi Boseki Kabushiki Kwaisha. August 7th. (Japan, December 20th, 1922.)
20,139. "Traffic signalling systems." W. Austin. August 7th.
20,146. "Thermionic valves." W. E. M. Ayres. August 7th.
20,149. "Exciting mercury-vapour rectifiers." Akt. Ges. Brown, Boveri et Cie. August 7th. (Germany, August 7th, 1922.)
20,152. "Apparatus for regulating electric current." J. S. Withers (E. A. Davis). August 7th.
20,155. "Telephones." N. Smith. August 7th.
20,169. "Air-cooling systems for ventilation of electrical machinery." A. W. Ardern, G. W. Black, Heenan & Froude, Ltd., and G. H. Walker. August 8th.
20,172. "Receiving, &c., apparatus for wireless telegraphy, &c." Funktechnische Ges. August 8th. (Germany, August 28th, 1922.)
20,175. "Variable electric condensers, variometers, &c." W. H. Murad. August 8th.
20,183. "Boxes for cables, &c." J. Guilfoyle. August 8th.
20,184. "Wireless telegraph, &c., receiving set." S. R. Quigley. August 8th.
20,209. "Landing lights for aircraft." H. E. S. Holt. August 8th.
20,220. "Electric heating elements." E. P. Barfield, J. P. D. Coleman, and L. W. Wild. August 8th.
20,222. "Circuit arrangements for automatic switches used in telephone systems." Automatic Telephone Manufacturing Co., Ltd. August 8th. (United States, July 22nd, 1921.)
20,240. "Discharge tubes." Naamlooze Vennootschap Philips' Gloeilampenfabricken. August 8th. (France, February, 1921.)
20,247. "Means for secret wireless intercommunication." F. Hodgson and E. H. Wright. August 9th.
20,271. "Electric reversing switches." E. D. Wynn. August 9th.
20,290. "Auxiliary crystal rectifier for wireless telegraph, &c., instruments." V. C. Wilkinson. August 9th.
20,292. "Grid leak for wireless telegraphy, &c." W. H. Le Breton and R. Woods. August 9th.
20,296. "Manufacture of electric incandescent vacuum lamps." N. R. Campbell and General Electric Co., Ltd. August 9th.
20,303. "Winding of coils." S. Calamatianos. August 9th.
20,359. "Control of trains." A. R. Angus. August 10th.
20,363. "Coil-holders for wireless telegraphy, &c." A. K. Cooper, Hurton-Whiffin Manufacturing Co., R. B. Whiffen, and W. W. Whiffen. August 10th.
20,369. "Switchboards." L. Ubrig. August 10th. (France, September 12th, 1922.)
20,388. "Electric resistance welding." C. A. Hadley and Rose Street Foundry and Engineering Co., Ltd. August 10th.
20,398. "Electric clocks." C. E. Prince. August 10th.
20,408. "Multiplex telegraph systems." Automatic Telephone Manufacturing Co., Ltd., and H. H. Harrison. August 10th.
20,409. "Support for indoor aerials." R. B. Gill. August 10th.
20,426. "Wireless transmission and reception of signals." H. Kirschfeldt. August 10th.
20,428. "Apparatus for eliminating interference, &c., in wireless telegraphy." W. S. Worthington. August 10th.
20,461. "Wireless systems." T. H. Kinman. August 11th.
20,469. "Radio-receiving systems." Marconi's Wireless Telegraph Co., Ltd. August 11th. (United States, August 12th, 1922.)
20,471. "Thermally-controlled switches." British Thomson-Houston Co., Ltd. August 11th. (United States, August 11th, 1922.)
20,484. "Magnetic brakes." F. B. Holt and Metropolitan-Vickers Electrical Co., Ltd. August 11th.
20,486. "Locking devices for incandescent electric lamps." A. H. T. Glenny. August 11th.
20,497. "Terminals for attachment of wires." R. E. Beswick and Radio Communication Co., Ltd. August 11th.
20,499. "Sound-reproducing, &c., devices." S. Calamatianos. August 11th. (Belgium, February 26th.)
20,501. "Sound-reproducing, &c., devices." S. Calamatianos. August 11th.
20,502. "Dynamo-electric machines." Tilling-Stevens Motors, Ltd., and H. K. Whitehorn. August 11th.

PUBLISHED SPECIFICATIONS.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken

1922.

2,294. "Methods of, and apparatus for recording sound and like waves." British Thomson-Houston Co., Ltd. May 20th, 1921. (180,296.)
2,430. "Machines for coating current-conducting wires, cords, and cables with asbestos, cotton, or the like." F. Chiantore. January 26th, 1922. (201,189.)
5,376. "Electric heating devices." E. Schattner. February 23rd, 1922. (201,192.)
8,899. "Indicating mechanism for telegraph tape perforators." E. E. Kleinschmidt. March 28th, 1922. (201,201.)
11,369. "Circuit arrangements for operating automatic or semi-automatic telephone systems." Siemens Bros. & Co., Ltd., C. L. Peters, and J. Berry. April 22nd, 1922. (201,218.)
11,380. "Telephone systems." Ges. für Drahtlose Telegraphie. April 23rd, 1921. (178,860.)
11,383. "Manufacture of fuscheads for electrical firing." Nobels Explosives Co., Ltd., and W. O. Littlebury. April 22nd, 1922. (201,220.)
11,469. "Sparking plugs." A. Taylor and E. C. Homan. April 24th, 1922. (201,225.)
11,694. "Coin-released gas and electricity meters." P. F. E. Major, G. H. Miles, and C. C. Smith. April 26th, 1922. (Cognate application, 16,419/22.) (201,233.)
12,072. "Insulating material." W. S. Smith. April 29th, 1922. (201,249.)
12,108. "Vacuum tubes of the thermionic type." C. Holt. May 1st, 1922. (201,250.)
12,199. "Electric ciphering apparatus." A. Scherbius. May 23rd, 1921. (180,653.)
12,309. "Electrical advertising cash change plate." C. W. Moss. May 2nd, 1922. (201,254.)
12,369. "Automatic telephone switches." Western Electric Co., Ltd., and G. Deakin. May 2nd, 1922. (201,256.)
12,419. "Wire cable couplings." C. Forrest, A. Sym, W. E. Gunthorpe, and R. Sym. May 3rd, 1922. (201,258.)
12,654. "Electro-mechanical apparatus for working and controlling points for railways and the like." A. Monard. May 30th, 1921. (180,992.)
12,662. "Antenna systems for wireless communications." E. Y. Robinson. May 5th, 1922. (Cognate application 28,324/22.) (201,264.)
12,753. "Bi-polar electrode electrolysers." Mather & Platt, Ltd., S. F. Barclay, and H. E. Mellor. May 5th, 1922. (201,267.)
12,855. "Conversion of electric currents." M. D. Hart. May 6th, 1922. (201,272.)
13,047. "Wireless systems." N. F. S. Hecht. May 9th, 1922. (201,276.)
13,082. "Controllers for electric traction and other electric systems or apparatus." R. Brooks and W. T. Gray. May 9th, 1922. (201,277.)
13,355. "Sparking plugs." Sphinx Manufacturing Co., Ltd., and D. H. Corbin. May 11th, 1922. (201,285.)
13,425. "Electric switches." A. L. Davis. May 12th, 1922. (201,288.)
13,663. "Electric signalling apparatus utilising the principle of the Wheatstone bridge." Schneider et Cie. June 15th, 1921. (181,692.)
13,762. "Electrical contacts." J. B. Bolitho. May 16th, 1922. (Cognate application 4,586/23.) (201,299.)
13,834. "Apparatus for power production." M. Benson. May 16th, 1922. (201,304.)
13,926. "Terminals or connections for electric conductors." British Thomson-Houston Co., Ltd., A. P. Young, and E. G. Parrott. May 17th, 1922. (201,308.)
14,196. "Method of, and means for utilising the sound-conveying and amplifying parts of a gramophone or the like, as a loud-sounding or speaking delivery agent for wireless or other telephony or telegraphy." A. M. Keays and F. Paton-Moore. May 19th, 1922. (201,313.)
14,211. "Connecting and supporting devices for electric fixtures." Benjamin Electric, Ltd. June 23rd, 1921. (182,097.)
14,225. "Transmitting antenna systems for wireless telegraphy and telephony." Ges für Drahtlose Telegraphie. May 27th, 1921. (180,673.)
15,473. "Electrical distribution apparatus." W. T. Henley's Telegraph Works Co., Ltd., E. E. Judge, and E. Moor. June 1st, 1922. (201,327.)
15,535. "Sound-reproduction and apparatus therefor." J. G. A. Kitchen. June 2nd, 1922. (201,328.)
15,737. "Multi-light electric lamp fittings." M. J. Railing and C. W. Saunders. June 6th, 1922. (201,331.)
16,935. "Multi-voltage system of control for elevators." Waygood-Otis, Ltd. (Otis Elevator Co.). June 19th, 1922. (201,352.)
17,149. "Electrically-driven rotary pump, with reducing gear." J. W. Flower. June 21st, 1922. (201,356.)
17,386. "Surface wiring for electricity distributing systems." T. H. Martin-Harvey. June 23rd, 1922. (Cognate application 29,501/22.) (201,360.)
17,592. "Recording apparatus for radio communication." A. Colleye. August 30th, 1921. (185,396.)
17,800. "Electro-magnetic remote-control apparatus." W. D. Dale, R. A. Hopkinson, and J. Hopkinson & Co., Ltd. June 28th, 1922. (201,368.)
18,310. "Arrangement for making connection to electricity meters." Landis & Gyr Akt. Ges. July 5th, 1921. (182,793.)
18,968. "Electrical control gear." R. H. Barbour and J. R. Walton. July 11th, 1922. (201,380.)
19,380. "Lightning arresters." British Thomson-Houston Co., Ltd. (General Electric Co.). July 14th, 1922. (201,388.)
20,421. "System for the distant control of a direct-current electric motor." F.I.A.T. Soc. Anon. August 9th, 1921. (184,456.)
20,526. "Telephone and like head instruments." E. W. Pattison (Dictograph Products Corporation). July 27th, 1922. (201,403.)
21,377. "Reception of wireless signals." Soc. Française Radio-Electrique. October 11th, 1921. (187,206.)
21,427. "Microscope illuminators." C. Beck, H. C. Beck, and C. J. Beck. August 5th, 1922. (201,414.)
22,890. "Sparking plugs." A. G. Brown. August 22nd, 1922. (201,427.)
22,937. "Telephone scribbling-block holder." C. H. J. Harvey. August 23rd, 1922. (201,428.)
23,339. "Electric lamps with enclosed arc discharge." H. Wade (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). August 28th, 1922. (Convention date not granted.) (185,412.)
23,766. "Tools for the manufacture of telephone receivers and the like." C. Brandes, Inc. July 11th, 1922. (200,785.)
23,815. "Junction boxes for electric cables." Mavor & Coulson, Ltd., and W. Lawrence. September 2nd, 1922. (201,433.)
24,577. "Aluminium electrolytic rectifier." Z. Takahashi. September 11th, 1922. (201,441.)
25,609. "Electrolytic process and apparatus for making an alloy of lead with the metals calcium, strontium, and barium." W. Mathesius and H. Mathesius. September 21st, 1922. (201,447.)
26,278. "Sparking plugs." R. Bosch Akt. Ges. July 5th, 1922. (200,476.)
26,986. "Sparking plugs." R. Colin. October 5th, 1922. (201,453.)
27,766. "Electric bells." Cable Accessories Co., Ltd., F. H. Reeves, and P. W. Davis. October 13th, 1922. (201,456.)
28,714. "Protective devices for electric circuits." British Thomson-Houston Co., Ltd., and A. S. Fitzgerald. January 23rd, 1922. (Divided application on 188,001.) (Addition to 188,001.) (201,460.)
28,942. "Electric bulb holders." S. Percival (C. E. Wells and H. F. Llewellyn). October 24th, 1922. (201,462.)
29,890. "Electric alarm clock." W. Rausch. November 1st, 1922. (201,470.)
29,982. "Current-collecting devices for dynamo-electric machines." J. H. St. H. Mawdsley. November 2nd, 1922. (201,471.)
30,575. "Electric motor-control apparatus." British Thomson-Houston Co., Ltd., E. B. Tuppen, and G. O. Watson. November 8th, 1922. (201,476.)

1923.

8,210. "Accumulator charging boards." G. A. H. Wootton. April 19th, 1923. (201,505.)
8,975. "Device for the automatic operation of an electric-circuit breaker controlled by the pressure of a liquid or gaseous medium." Maschinenfabrik Oerlikon. April 4th, 1922. (195,962.)

Transvaal Platinum Discovery.—The *Times* Johannesburg correspondent says that it is reported that discoveries of platinum have been made in the Waterberg district of the Transvaal. The reef has been traced for 30 miles and samples have been obtained showing the presence of platinum and payable gold. Negotiations are in progress for the purchase of ten farms upon which options have been obtained.